NAVAL POSTGRADUATE SCHOOL
MONTEREY, CALIFORNIA 93943-5101

# NAVAL POSTGRADUATE SCHOOL

## Monterey, California

# THESIS

A METHODOLOGY FOR
CAPTURING AND ANALYZING DATA
FROM TECHNOLOGY BASE SEMINAR WARGAMES

by

Jeffrey T. Miles

September 1991

Thesis Co-Advisors: Samuel H. Parry
Kenneth A. Solomon

Approved for public release; distribution is unlimited

# REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

| | |
|---|---|
| 1a. REPORT SECURITY CLASSIFICATION<br>UNCLASSIFIED | 1b. RESTRICTIVE MARKINGS |
| 2a. SECURITY CLASSIFICATION AUTHORITY | 3. DISTRIBUTION/AVAILABILITY OF REPORT<br>Approved for public release; distribution is unlimited |
| 2b. DECLASSIFICATION/DOWNGRADING SCHEDULE | |
| 4. PERFORMING ORGANIZATION REPORT NUMBER(S) | 5. MONITORING ORGANIZATION REPORT NUMBER(S) |
| 6a. NAME OF PERFORMING ORGANIZATION<br>Naval Postgraduate School<br>6b. OFFICE SYMBOL<br>OR | 7a. NAME OF MONITORING ORGANIZATION |
| 6c. ADDRESS (City, State, and ZIP Code)<br>Monterey, CA 93943-5000 | 7b. ADDRESS (City, State, and ZIP Code) |
| 8a. NAME OF FUNDING/SPONSORING ORGANIZATION<br>8b. OFFICE SYMBOL | 9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER |
| 8c. ADDRESS (City, State, and ZIP Code) | 10. SOURCE OF FUNDING NUMBERS<br>PROGRAM ELEMENT NO. / PROJECT NO. / TASK NO. / WORK UNIT ACCESSION NO. |

11. TITLE (Including Security Classification)
A METHODOLOGY FOR CAPTURING AND ANALYZING DATA FROM TECHNOLOGY BASE SEMINAR WARGAMES

12 PERSONAL AUTHOR(S)
MILES, Jeffrey T.

| 13 TYPE OF REPORT | 13b. TIME COVERED FROM TO | 14. DATE OF REPORT (Year, Month, Day) | 15. Page Count |
|---|---|---|---|
| Master's thesis | | 1991, September | 215 |

16. SUPPLEMENTAL NOTATION
The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.

| 17. COSATI CODES | | | 18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number) |
|---|---|---|---|
| FIELD | GROUP | SUB-GROUP | Technology Base Seminar Wargame, Categorical Judgements Survey |
| | | | |
| | | | |

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

Thls thesis provides a structured methodology for obtaining, evaluating, and portraying to a decision maker, the opinions of players of Technology Base Seminar Wargames (TBSW). The thesis then demonstrates the methodology by applying the events of the Fire Support Technology Base Seminar Wargames held in May 1991. Specifically, the evaluation team developed six surveys, each survey capturing opinions using the categorical judgements technique. The subject of each of the surveys comes from characteristics and systems within six major Fire Support areas of Interest, target acquisition, weapons and munitions, command and control, support and sustainment, fundamental principles of future combat, and technologies and systems. These areas of interest were provided by the United States Field Artillery School and United States Army Laboratories Command, co-sponsors of the TBSW. These surveys were administered at the Fire Support TBSW In May 1991. The results are calculated using a scaling method and are displayed In a manner that Illustrates the strength of preference for each of the characteristics of system, and the category in which they fall. Using these easily readable, graphical results, the decision maker can now use the findings of TBSWs, a previously unattainable task.

| | |
|---|---|
| 0 DISTRIBUTION/AVAILABILTIY OF ABSTRACT<br>[X] UNCLASSIFIED/UNLIMITED [ ] SAME AS RPT. [ ] DTIC | 1a. REPORT SECURITY CLASSIFICATION<br>Unclassified |
| 2a. NAME OF RESPONSIBLE INDIVIDUAL<br>amuel H. Parry | 22b. TELEPHONE (Include Area Code)<br>(408)646-2779<br>22c. OFFICE SYMBOL<br>OR/Py |

D Form 1473, JUN 86 Previous editions are obsolete. S/N 0102-LF-014-6603

Approved for public release; distribution is unlimited

# A Methodology for Capturing and Analyzing Data from Technology Base Seminar Wargames

by

Jeffrey T. Miles
Captain, United States Army
B.S., United States Military Academy

Submitted in partial fulfillment
of the requirements for the degree of

MASTER OF SCIENCE IN OPERATIONS RESEARCH

from the

NAVAL POSTGRADUATE SCHOOL
September 1991

## ABSTRACT

This thesis provides a structured methodology for obtaining, evaluating, and portraying to a decision maker, the opinions of players of Technology Base Seminar Wargames (TBSW). The thesis then demonstrates the methodology by applying the events of the Fire Support Technology Base Seminar Wargame held in May 1991. Specifically, the evaluation team developed six surveys, each survey capturing opinions using the categorical judgments technique. The subject of each of the surveys comes from characteristics and systems within six major Fire Support areas of interest, target acquisition, weapons and munitions, command and control, support and sustainment, fundamental principles of future combat, and technologies and systems. These areas of interest were provided by the United States Field Artillery School and United States Army Laboratories Command, co-sponsors of the TBSW. These surveys were administered at the Fire Support TBSW in May 1991. The results are calculated using a scaling method and are displayed in a manner that illustrates the strength of preference for each of the characteristics and systems, the interval between each characteristic of system, and the category in which they fall. Using these easily readable, graphical results , the decision maker can now use the findings of TBSWs, a previously unattainable task.

1 A053
NPS 585235
2.1

## THESIS DISCLAIMER

The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the United States Government.

The reader is cautioned that computer programs utilized/developed in this research may not have been exercised for all cases of interest. While every effort was made, within the time available, to ensure that the programs are free of computational and logic errors, they cannot be considered validated. Any application of these programs without additional verification is at the risk of the user.

Unless otherwise stated, whenever the masculine or feminine gender is used, both men and women are included.

TABLE OF CONTENTS

I. INTRODUCTION . . . . . 1

II. NATURE OF THE PROBLEM . . . . . 7

A. PURPOSE . . . . . 8

B. THE ORGANIZATION . . . . . 9

C. PROCESS . . . . . 13

III. EXPERIMENTAL DESIGN . . . . . 16

A. DATA COLLECTION . . . . . 17

1. Purpose of the Survey . . . . . 17

2. General Design Development . . . . . 17

3. USAFAS Requirements . . . . . 19

4. LABCOM Requirements . . . . . 20

5. Specific Survey Design . . . . . 21

a. Paired Comparisons . . . . . 21

b. Graphic Rating Scale . . . . . 22

c. Categorical Judgements . . . . . 22

6. Stimulus Design . . . . . 22

7. Response Field Design . . . . . 23

a. Category Description . . . . . 24

b. Instances . . . . . 25

8. Survey Administration . . . . . 26

B. ANALYZING THE RESULTS . . . . . 27

1. Step By Step Procedure For Obtaining Scale

Values . . . . . 28
2. Incomplete $z_{ij}$ Arrays . . . . . 29
3. Example Problem . . . . . 30
C. MAKING THE RESULTS "FRIENDLY" TO A DECISION MAKER . . . . . 31

IV RESULTS . . . . . 32
A. SURVEY 1 (TARGET ACQUISITION) . . . . . 32
B. SURVEY 2 (WEAPONS) . . . . . 34
C. SURVEY 2 (MUNITIONS) . . . . . 35
D. SURVEY 3 (COMMAND AND CONTROL) . . . . . 37
E. SURVEY 4 (SUPPORT,SUSTAINMENT, STRATEGIC DEPLOYMENT AND TACTICAL MOBILITY) . . . . . 38
F. SURVEY 5 (FUTURE COMBAT CHARACTERISTICS) . . . 39
G. SURVEY 6 (PAST WARGAME TRENDS) . . . . . 40
H. CLOSE VERSUS LONG FIRES . . . . . 41
I. DESERT VERSUS JUNGLE VERSUS NORTHERN CONTINENTAL SCENARIOS . . . . . 43

V. CONCLUSIONS AND RECOMMENDATIONS . . . . . 45

LIST OF REFERENCES . . . . . 49
DISTRIBUTION LIST . . . . . 146

## LIST OF FIGURES


Figure 1 The Process . . . . . 4

Figure 2 Surveys Attempted . . . . . 10

Figure 3 The Participants . . . . . 12

Figure 4 Example Results . . . . . 31

Figure 5 Target Acquisition Systems . . . . . 33

Figure 6 Weapons Systems . . . . . 34

Figure 7 Munitions . . . . . 35

Figure 8 Command and Control Systems . . . . . 37

Figure 9 Support and Sustainment Systems . . . . . 38

Figure 10 Fire Support Component Systems . . . . . 39

Figure 11 Top Ten Systems . . . . . 40

Figure 12 Weapon Systems Comparison . . . . . 41

Figure 13 Munitions Comparison 1 . . . . . 43

Figure 14 Munitions Comparison 2 . . . . . 44

# I. INTRODUCTION

The 100-hour war between the United Nations alliance and Iraq was one of the most overwhelming military operations of all time. The total surprise after movements of thousands of men and pieces of equipment, the great distances covered, the harsh environment on which the scene unfolded, and the accuracy and lethality of the United Nations alliance force all made the operation uniquely spectacular. And what were the causes of this overwhelming victory? There were many, but the superior United States (U.S.) technology has to be one of the top items on the list.

Now look to the future. Assume that the U.S. wants to maintain its technological edge, a fair assumption considering the results in Iraq. With the time interval from conception of a new system to fielding the system being as much as twenty years, some of the new systems used in the Iraq campaign were being conceived in the early 1970's. Therefore, systems needed for the year 2010 and beyond must be conceived today. But how are these systems conceived? One method used by United States Army Laboratories Command (LABCOM), is to gather technologists (those that build the systems) and tacticians (those that use the systems) at one location, focus them on one issue such as fire support or logistics, and have them interact in seminar wargames with possible scenarios which

might take place 20-25 years in the future. LABCOM has conducted several of these Technology Base Seminar Wargames in the recent past. Certainly no one can see the future, but one hope is that through an analytic synthesis of evaluations from experts in technology and tactics, proposed systems can be examined and the most meaningful technologies for the future selected and developed. Such wargames bring technologists and tacticians together so that each develop a better understanding of the other's difficulties and problems. One of the problems with seminar wargames, however, has been the collection and assessment of results. During the seminars, participants gain a great knowledge of the technological requirements seen to be successful on future battlefields, but the Army's decision makers may gain maximum benefit from the process because of a limited analysis made in assessing wargame results. Unfortunately, after each of these wargames, the three of four days of thought from upwards of 100 experts, the money spent on bringing them together, and most importantly, the knowledge and understanding generated on the proposed systems and concepts are not captured in an analytically meaningful way. In more recent seminar wargames, there has been an attempt to compile summary findings, but these attempts were the observations of one or two people who tried to capture the opinions of all participants just through listening and watching the proceedings. Needless to say, this method has many drawbacks as the summarizers cannot be in

every seminar all the time, they may already have an established bias on many issues, and cannot remember all the relevant ideas that occurred over the course of three or four days. Basically, at the end of the seminar wargame, participants walked away with a increased personal knowledge, the Army got little readily usable output or the perhaps biased opinion of the report compilers, and the taxpayers received a bill for hundreds of thousands of dollars. These observations motivated the need for this research.

The genesis of this thesis was a request from LABCOM to TRADOC Analysis Command (TRAC) Monterey. The request was for a methodology to incorporate the findings and conclusions generated in LABCOM's ongoing series of Technology Base Seminar Wargames that can be readily used in a decision making process. This decision making process is typically for technology investment in many areas, from target acquisition systems to munitions systems to logistics systems. As part of the TRAC - Monterey team, the author used the methodology at the Fire Support Technology Base Seminar Wargame at Fort Sill Oklahoma in May 1991. The scope of this thesis focused on capturing the essence of opinions of wargamers from the Fire Support Technology Base Seminar Wargame to assist decision makers better invest in future technologies and systems. Developing the methodology required accomplishing three tasks: constructing a meaningful opinion measurement instrument, analyzing the results of the measurement instruments, and

portraying the results in a manner that assists a decision maker to quickly see the the strength of preference of the systems and characteristics.

Once given the task to develop the methodology, the three agencies involved (USAFAS, LABCOM, and TRAC Monterey) used the following process to complete the task (Figure 1). First, they decided on the conduct of the wargame with its scenarios, systems, and participants. Then the evaluation team designed the survey. Individuals from the RAND Corporation were also instrumental in this phase. They suggested a method of combining characteristics and systems in an hierarchy that provides a systematic approach to data gathering. Next, the team administered the survey at the Fire Support Technology Base Seminar Wargame at Fort Sill, Oklahoma in May 1991. Following survey administration, the responses were recorded and analyzed at TRAC Monterey in June 1991. Finally, the team presented the results in a graphical form to representatives of the Field Artillery School in July 1991.

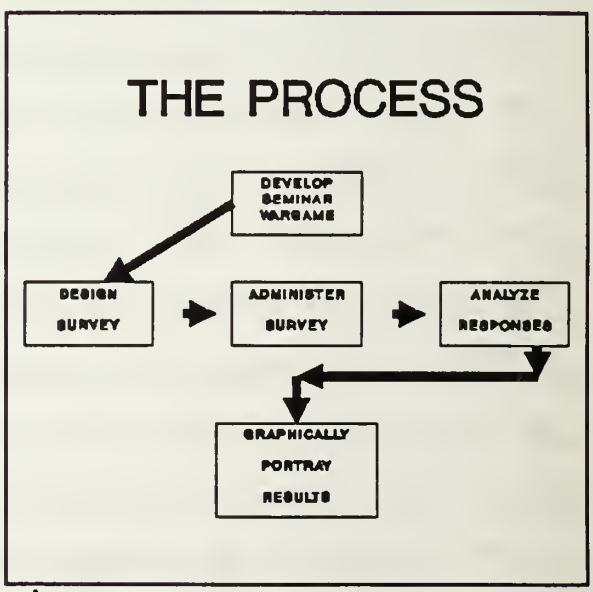



**Figure 1** The Process

The thrust of this methodology is not to be a panacea to answer all questions that deal with investing in future technologies and systems. This is, however, more than just another tool! The seminar wargame uses experts in two fields, tactics and technology, places them on actual terrain with realistic future missions, probable future threats, and proposed future systems and lets them simulate battles against each other. The methodology collects and analyzes these expert opinions, and then measures these strengths of preference. This accomplishes much more than a simple and perhaps unintentionally biased summary. There are, however, some disadvantages. By the nature of the wargame structure the results portray nothing about scenarios that are not played, and by the questionnaire structure the results portray nothing about technologies or systems that are created by the players during the seminar wargame.

There have been many attempts to predict the future, but this thesis is unique in that it is the first systematic method for analyzing TBSWs which try to forecast future needs. The following chapters lead the reader through a discussion of exactly what a Technology Base Seminar Wargame is and does (Chapter II), development of the data collection surveys and an explanation of the analysis methodology (Chapter III), a graphical presentation of some of the results of each survey (Chapter IV), and some concluding remarks on individual survey results and the overall methodology (Chapter V). Appendix A

is added to walk the reader through one example of the analysis methodology. Apppendix B shows the participants and the breakdown of the actual Fire Support Technology Base Seminar Wargame. Appendix C lists the abbreviations used throughout the thesis and in the surveys. Appendix D provides the computer programs used to conduct the analysis. The last two appendices, Appendix E and F, portray the results and the surveys, respectively.

## II. NATURE OF THE PROBLEM

Obtaining and analyzing data from technology base seminar wargames is unlike gathering and analyzing data from most other wargames for several reasons. First, the wargames are not computer assisted. Since all the systems portrayed in the wargame are proposed systems, and many systems are created during the discussions, there are no constant parameters for the systems. Therefore the systems cannot be programmed into a computer to be used during the wargame. Without the computer assistance there is really few ways to keep track of results except by someone acting as a scribe. The purpose of conducting the wargame in a seminar is to have a relatively free flow of ideas and the requirements of a scribe would detract from this process.

Second, while the game is as realistic as possible (the game is played on a map of actual threat areas, one group plays the Red force and the other plays the Blue force, and each force has a mission), there are no game pieces, system parameters, or time periods to constrain the participants so the game is much more free flowing than a traditional wargame which has game turns, defined systems, and game pieces. This seminar process creates much discussion and many new ideas which is what is desired, but it does not provide any mechanism for tracking results or measuring effectiveness.

Third and last, because of the high cost of bringing approximately one hundred experts together from across the country for a one three day period, data gathering in the technology base seminar wargames is a one-shot deal that cannot be conducted again and again like most of our current wargame models. Therefore, the data either are gathered the first time around or are lost forever. Data lost forever is exactly what happened in past Technology Base Seminar Wargames. For the above reasons a new method of gathering, analyzing, and displaying the data had to be developed.

Before explaining the methodology, the following paragraphs detail the purpose, conduct, and participants of a Technology Base Seminar Wargame.

## A. PURPOSE

> "The purpose of these games is to bring material developers and users together to assess the value of technologies on the future battlefield. The results of these games are information sources for determining the Technology Base Investment Strategy [Ref. 1: p.1].

The above stated purpose is really a combination of three goals. First, technology base seminar wargaming provides technologists (those that create the systems) from the different Army laboratories and Army tacticians (those that fight the systems) a meeting ground so that technologists can see what is needed and tacticians understand what is feasible. Secondly, the participants assess currently proposed systems. Tacticians change them as needed and technologists change them

as feasible. During the wargame better systems are developed, and all players better understand the combat value of each proposed system. Finally, the results are supposed to be "information sources" for technology investment decisions. The first goal has been achieved during each seminar wargame, and this has made participants "feel" good, but has done very little directly for technology investments. The last two goals are probably much more important as far as dollars, or in the lives of American soldiers, and so far the process has been severely deficient in these two areas.

The three goals just listed define what the wargame accomplishes, probably just as important are the limits of each game. These limits include the following. There is no discussion of the monetary cost of each system, of the technological uncertainty of developing the system, or of the monetary cost of developing the system. All three limitations of the competing systems are considered equivalent, and therefore do not weigh in any decision making during the wargame.

## B. THE ORGANIZATION

The number of participants varies for each wargame, but the figures here are representative of past and projected wargames. A total of 106 individuals participated in the technology base seminar wargame of which 97 participated in the data collection by answering at least one survey. Figure

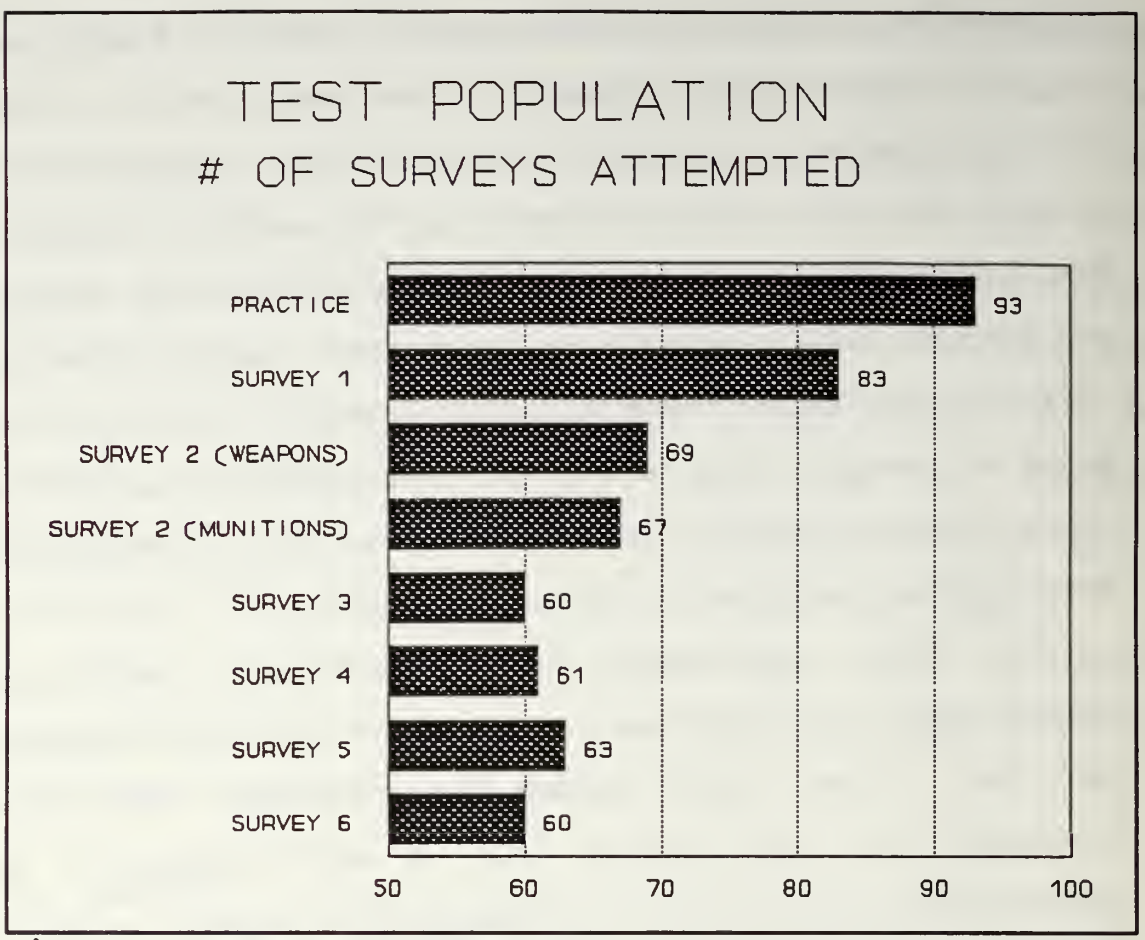



**Figure 2 Surveys attempted**

2 displays how many surveys participants answered.

The participants represent the six Army laboratories (Ballistics Research, Harry Diamond, Human Engineering, Atmospheric Science, Avionics, and Engineer Topographic), eight Army centers (Chemical Research and Development, Aberdeen Research and Development, Foreign Science and Techology, Logistic Management, Signal, Infantry, Belvoir Research and Development, and Night Vision Electro-optics), eight different Army commands (Training and Doctrine,

Material, Natick Research and Development, Missile, Communications and Electronics, Laboratory, Tank Automotive, and Medical Research and Development), and seven Army schools (Field Artillery, Air Defense Artillery, Infantry, Armor, Aviation, Command and General Staff, and the Air University). The Army was also represented by ranks CPT through MAJ General and by many branches to include Infantry and Armor officers from Combat units, and Field Artillery, Aviation, and Engineer officers from Combat Support units. In this particular Technology Base Seminar Wargame the actual wargame players from the technologists and tacticians were divided into three groups of approximately twenty-three each, half technologists and half tacticians. Each of these groups concentrated in one of the following regions; desert, tropical, or northern continental. These three regions were chosen as the most likely representative threat areas by the USAFAS. Each of these regional groups was then divided in half in order to evaluate the two different types of fires, long range or close range. The two different types of fires were chosen because of the USAFAS's long running concern for the different effects and requirements of close and long range fires. Finally, each long or close range fires group was divided into Red and Blue teams to portray opposing sides during the wargame. The creation of opposing sides added an air of competition that theoretically motivated more creative options. Figure 3 shows

how the participants were organized. A list of all the participants in their groups is enclosed in Appendix B.

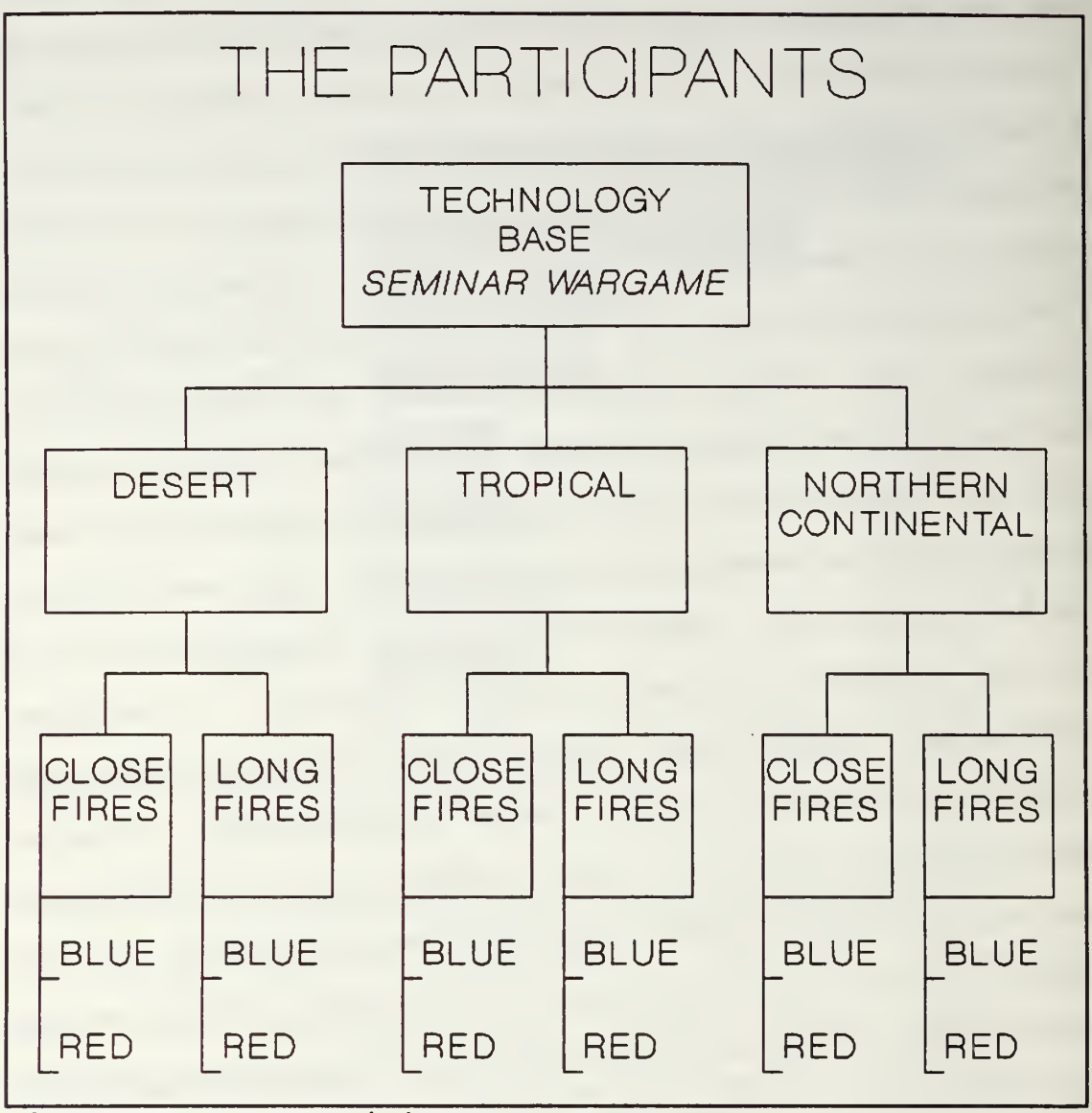



**Figure 3 The Participants**

To further add realism to the wargaming, each regional group was assigned advisors in weather, logistics, and chemical/smoke effects. Lastly, each regional group was assigned two wargame advisors (one for long range fires and

one for close range fires) that acted as facilitators to encourage discussion and ensure events ran in a timely manner.

## C. PROCESS

Each Technology Base Seminar Wargame has its own individual quirks, but the basic process is the same in each. This Technology Base Seminar Wargame process began with all participants gathered together in a main lecture hall. They were briefed on the following; the purpose, the groupings, the future scenario, and the data collection method. The purpose and grouping briefings provided the motivation to do a thorough job and the organization with which to do this, respectively. The future scenario briefing described possible future situations the Army considers possible. This ensured all participants had a common starting ground for understanding the United States Army future missions, probable enemies, possible terrain, and troops available (future systems and their effects). The data collection briefing described the surveys and ensured all participants received the same instructions in an effort to reduce any bias caused by differing instructions. The participants also filled out a practice survey to familiarize themselves with the survey completion process and to avoid misinterpretations later in the process.

After the initial briefings, each regional group retired to their own room where two mapboards surrounded by chairs

awaited them, one for the close fires group and one for the long fires group. Initially and within each close and long range fires group, the Red and Blue groups independently spent time discussing how to use their systems and technologies. Then each Red and Blue group pairing came together to discuss strengths and weaknesses of their own systems and technologies against the opposing force's systems and technologies. Finally, each close and long range group independently discussed what technologies and systems not present were needed and which technologies and systems present were not needed. These observations were captured by two methods; a briefing prepared by each regional group and presented to all the regional groups, and in a survey. This process was repeated four times over the three days. Each repetition had the following different focus; target acquisition, weapons systems and munitions, command and control, and finally, support, sustainment, and deployability. Because of the four different focuses, each survey was different in that it asked questions of systems that were specific to that repetition. At the conclusion of the four repetitions, all participants gathered for an outbrief and two final surveys. These surveys questioned overall trends that emerged throughout the four repetitions. Table 1 portrays the six different surveys with their corresponding area of focus.

TABLE 1. SURVEY DESCRIPTION

| Survey # | Area of Focus |
|---|---|
| I | Target Acquisition |
| II | Weapons Systems and Munitions |
| III | Command and Control |
| IV | Support, Sustainment, Strategic Deployability, and Tactical Mobility |
| V | Combat Power and Battlefield Operating Systems |
| VI | Emerging Systems and Technologies |

# III. EXPERIMENTAL DESIGN

> "The objectives of technology seminar war gaming are creative stimulation and idea collection, rather than finite measures of effectiveness among competing weapon systems and tactics" [Ref. 1:p. 2].

In previous seminar wargames, participants verbally expressed their views where the strong personalities (not necessarily the majority or the most informed of the group) could express their views the loudest. Ideas were summarized in a report which was one or two individuals' interpretation of the events. With the events often taking place over several days, and despite the best intentions, it was easy for this person or people to forget, misinterpret, express the opinions of only the vocal members of the group, or advance their own conclusions rather than advance the opinions of the whole. It is likely that many usable ideas were never expressed or were expressed only briefly before suppressed or forgotten in order to move on to other points of interest. For this reason, LABCOM contacted TRAC Monterey to develop a methodology supported by a survey to collect, analyze, and portray results of Technology Base Seminar Wargames and specifically the Fire Support Technology Base Seminar Wargame.

## A. DATA COLLECTION

### 1. Purpose of the Survey

The principle data collection tool is the survey of wargame participants. The survey satisfies the objectives of two different proponents, LABCOM and USAFAS. The USAFAS wanted to investigate and evaluate proposed systems within the Fire Support arena with the brain power that was assembled at the seminar wargame. LABCOM wanted to be creative, to conjure new systems and determine important technology characteristics across the broad spectrum of warfighting. USAFAS knew what questions they wanted answered, however, LABCOM did not. LABCOM recognized that there were much data lost at each wargame and did not want this repeated.

### 2. General Design Development

Satisfying USAFAS's agenda became relatively straight forward after a conversation with Mr. Bruce Goeller and spending considerable time with Dr. Kenneth Solomon, both of the RAND Corporation. The approach suggested by both calls for determining the important characteristics or capabilities needed to conduct the required task, and then evaluating the proposed systems with those important characteristics. For example, the proposed target acquisition systems are evaluated with key target acquisition characteristics. By first assessing the value of the characteristics/capabilities and then assessing the value of each proposed system within each

characteristic, the methodology provides excellent results to the USAFAS of the instance (system or characteristic) values, the interval between the instances, and the category bounds.

Determining the survey design for LABCOM was the tougher design problem. Because they wanted to capture the important characteristics and systems developed during the wargame, a fill-in-the-blank design was needed. Since they also wanted to know the importance of different characteristics/capabilities of future combat, the evaluation team generated a methodology that would provide instances, intervals, and bounds as above.

In order to accomplish all tasks (instance values, intervals, and bounds for USAFAS, fill-in-the-blank, instance values, intervals, and category bounds for LABCOM), six different surveys were designed. The first four surveys were administered after each of the four types of wargame, the four types being target acquisition, weapons systems and munitions, command and control, and support and sustainment. Each of these surveys had the same basic design. The first stimulus and response measured the important characteristics of the type wargame. The next group of stimuli and responses measured how well each system did in each of the characteristic areas. The last stimulus and response measured all the systems regardless of characteristic. The final portion was a fill-in-the-blank question to capture new ideas

before the participants left the area. Table 2 depicts the four areas of each of the first four surveys.

TABLE 2. SURVEY STIMULI FOCUS

| Stimulus # | 1 | 2,...,n-2 | n-1 | n |
|---|---|---|---|---|
| Focus of Stimulus | Character -istics | Systems measured against each characteristic | Systems measured against all character- istics | New ideas (fill in the blank) |

Each of these surveys gathered the data needed to accomplish the USAFAS task of evaluating the proposed systems and characteristics. These surveys also satisfied the LABCOM task of capturing the creative new ideas that were generated in the seminars. These surveys did not, however, rank characteristics of a broader nature that LABCOM also required. To accomplish this task, the evaluation team designed two final surveys that measured these broad characteristics.

### 3. USAFAS Requirements

USAFAS identified the proposed systems for the wargame. These systems and their abbreviations are given in Appendix C.

For the TBSW, USAFAS and TRAC Monterey developed characteristics to measure the desirability of these systems

since specific characteristics for target acquisition, weapons systems and munitions, command and control, and support, sustainment, and deployment were not available. The original lists of characteristics for both the target acquisition survey and the weapon systems and munitions survey came from the Army's tactical bible [Ref. 2:p. 13], the list for command and control came from a British Field Manual [Ref. 3:p. 69], and the list for support, sustainment, and strategic deployability and tactical mobility came from adjectives on the description of proposed combat service support equipment in an Army draft manual [Ref. 4:p. II-H-7]. To ensure complete and correctly worded lists, the USAFAS reviewed the characteristics. During the review, the characteristics changed dramatically. These changes ensured the proponent agencies the most usable data possible.

**4. LABCOM Requirements**

LABCOM wanted generic characteristics that spanned a broad spectrum of weapon systems. To accommodate this spectrum, the evaluation team considered the Principles of War [Ref. 2:p 173], the four characteristics of Combat Power [Ref. 2:p. 11], the Battlefield Operating Systems (BOS), and previous TBSW reports. After much consideration, the evaluation team dismissed the Principles of War as too nebulous for the seminar wargames. The evaluation team also reduced the four characteristics of combat power to three as

the characteristic of leadership was not an integral part of a "technology base" seminar wargame. They also reduced the seven BOS to only one, the system of Fire Support, as the others were not substantially addressed at this Fire Support wargame. The team also added two other lists taken from previous TBSW results, emerging technologies and emerging systems.

5. Specific Survey Design

After consultations with LABCOM, USAFAS, and TRAC Monterey, two requirements for the analyzed data became apparent. The methodology needed to measure the strength of preference participants had for the instances (characteristics and systems) and the interval between the instances. Several methods of gathering responses were considered for these tasks. A brief description of each follows.

a. Paired Comparisons

The method of paired comparisons requires each instance be compared to another. Therefore, if there are n instances, there are n(n-1)/2 judgements. With the following number of characteristics used in each of the first four surveys, 18, 16, 19, and 17, each participant would need to make 153, 120, 171, and 136 judgements, respectively, on the first question of each survey. When all the questions from all the surveys were included, the number of judgements for

each participant was considered too high to be used for this research [Ref. 5:p. 166].

b. Graphic Rating Scale

The graphic rating scale requires participants to indicate their judgements by marking a point on a line [Ref. 6:p. IV-D-p2]. This method allows for fine discrimination but can be hard to score. Because of the large number of responses and the difficulty in scoring, this method was discarded.

c. Categorical Judgements

This technique requires participants to select the category for each instance that best mirrors their opinion. Then the categorical ratings are used to construct an interval scale. The scale shows the location of the instances, the interval between instances, and the category bounds. The evaluation team chose this method because it provided categories that the other methods did not and it was easy to score. [Ref. 7:p. 1].

6. Stimulus Design

For ease of answering and scoring, the evaluation team designed each the same. The stimulus is divided into four parts and an example is provided below for reference.

Given a fixed budget and assuming that maximizing accuracy will win the war, indicate with what probability you would allocate funds to the following systems.

Each of the four parts of the stimulus has a different origin. The first part of the stimulus incorporates the phrase, "Given a fixed budget". The objective of the phrase is to discourage considering "everything" as equally important and encourage discrimination between instances. The phrase "assuming that maximizing accuracy" provided the answering participant a common mental yardstick with which to measure his response. This phrase attempts to preclude participants from mentally choosing different yardsticks and undermining the results. The phrase "will win the war" left no doubt in the participant's mind about the ultimate purpose of the question. The word "probability" was used vice words such as "importance" or "value" because of the ability to quantify probability. The unquantifiable words do not have the same meaning to everyone and destroy the precision in the test.

7. Response Field Design

The response field design can best be discussed in two parts, the category descriptions and the instances.

a. Category Description

The evaluation team designed each stimulus with seven response categories. The literature indicates that between 5 and 9 response categories are best depending on the situation [Ref. 7:p. 57, Ref. 6:p. IV-E-p1]. The number 7 was chosen for several reasons. The odd number provides those participants with a neutral opinion an obvious answer, the middle response category. Five was discarded as not providing enough precision in the answers. The evaluation team discarded nine as too many categories that made the answering process excessively difficult for the participants.

The team also described each category in two different manners, one being numeric and the other being verbal. The verbal descriptions came mainly from the Questionnaire Construction Manual and consisted of the following categories; very small, small, not great, borderline, reasonable, high, and very high [Ref. 6:p. VIII-D-p1]. The numerical range came from the article "How Probable is Probable" in the Journal of Forecasting. The results of this article were that numerical probabilities showed much lower variability than verbal probabilities, however, participants are much more comfortable with words than numbers [Ref. 8:p. 258]. Therefore the suggestion of the article and the method used in this survey was to include both verbiage and numerical probabilities in the category descriptions. The numerical categories from the article were separated as follows; 0-14, 15-28, 29-42, 43-57,

58-71, 72-85, and 86-100 [Ref. 8:p. 262]. The verbiage and the numerical probabilities were incorporated as follows.

| Verbal expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |

b. Instances

All instances (characteristics or systems) for the first four surveys came from the list of systems provided by the USAFAS or the list of characteristics generated by TRAC Monterey and subsequently reviewed and revised by USAFAS. The response descriptors for the final two surveys were also from a list generated by TRAC Monterey, but LABCOM reviewed and revised these. There was a conscious effort to keep this list of instances for each question less than ten, thus allowing the participants to make better judgements between the systems [Ref. 6:p. IV-E-p1]. The evaluation team had fair success with this approach in the systems questions of the first four surveys. The team, however, increased the list of characteristics for each survey considerably, as the needs of the sponsoring agency outweighed the desire to keep the list small. The surveys are included as Appendix E.

8. Survey Administration

The evaluation team administered seven surveys to the wargame participants over the three day period. The first survey was a practice survey administered during the opening session of the first morning. This introduced the participants to the survey structure in a common setting so that all received the same instructions and reduced the possibility of instruction induced differences. The next four surveys, Target Acquisition, Weapon Systems and Munitions, Command and Control, and Support and Sustainment and Strategic Deployability and Tactical Mobility, were administered in the regional group rooms around the map board during the seminar wargame process. The purpose of each of these surveys was to assess the instance values, measure the interval between the instances, and categorize the instances.

The team administered the final two surveys when all participants were gathered at the conclusion of the seminar wargames. The purpose of the final two surveys was to gather data on characteristics influencing future combat and to assess the strength of preference of emerging technologies and systems that were important in previous TBSWs, the interval between the strength of preference, and the category of each preference.

## B. ANALYZING THE RESULTS

LABCOM recorded all the results from the fill-in-the-blank questions for further study and will not be dealt with further in this thesis. The evaluation team analyzed the data collected from the categorical judgements with a method used on research projects of this type at the Naval Postgraduate School. This method produces a scale that portrays the instances, the interval between the instances, and the category boundaries [Ref. 9:p. 1]. Because of the need to provide the scaled instances and the interval between the instances, this method ideally suited the analysis. More than just seeing the instance values and intervals, the decision maker also sees the category bounds.

Five APL (A Programming Language) functions (Appendix C) were used to manipulate the numbers, four of these were developed by Professor Glenn F. Lindsay, an Operations Research Professor at the Naval Postgraduate School. The fifth function combined the results of the first four to provide the bounds, the instance value, and the interval between instances on the same scale.

The method used requires four assumptions and they are listed below [Ref. 9:p. 6].

1. A participant's "opinion" about the scale value of an instance (characteristic or system) i is a normally distributed random variable with mean $\mu_i$ and variance $\sigma_i^2$.

2. Participants view the continuum of values for instances as being broken into successive intervals called categories.

3. A participant's opinion about a category upper bound is a normally distributed random variable so that for category j, the upper bound would be normally distributed with mean $\mu_j$ and standard deviation $\sigma_i^2$.

4. All category bounds have the same variance, so that for all j, $\sigma_j^2 = c$.

### 1. Step By Step Procedure For Obtaining Scale Values

The following are the steps from Professor Lindsay's paper for obtaining scale values and category bounds.

a. Arrange the raw frequency data in a table where the rows are the instances and the columns are the categories. The columns should be in rank order, with column 1 representing the least favorable category.

b. Compute relative cumulative frequencies for each row, and record these in a new table. The last column of this new table will consist of unit values, and is omitted.

c. Treating these values as leftward areas under a Normal (0,1) curve, go to a table of the normal distribution and find the z values for these areas. Record these in a new n by (m-1) table. This is the $z_{ij}$ array for the following computations.

d. For each row i in the $z_{ij}$ array, compute the row average, $\bar{z}_i$.

e. For each column j in the $z_{ij}$ array, compute the column average. Call these column averages $b_j$, and note that $b_j$ is the value of the upper bound of category j on the scale.

f. Compute a grand average of all the values in the $z_{ij}$ array. This is readily done by simply averaging the column averages. Call the grand average $\bar{b}$.

g. Compute

$$B=\sum_{j=1}^{m-1}(b_j-\overline{b})^2$$

h. Compute for each row

$$A_i=\sum_{j=1}^{m-1}(z_{ij}-\overline{z_i})^2$$

i. For each row, compute $\sqrt{\frac{B}{A_i}}$ . This is an estimate of $\sqrt{\sigma^2{}_i+c}$ .

j. Finally, for each row (instance) compute

$$S_i=\overline{b}-\overline{z_i}\sqrt{\frac{B}{A_i}}$$

These are the scale values of the instances, and they are on the same interval scale as the category bounds $b_j$. Now use any linear transformation, $y=\alpha+\beta x$, $\beta>0$, to move the scale where it is needed. The APL function "RAW" in Appendix C uses this linear transformation.

**2. Incomplete $z_{ij}$ Arrays**

The one problem with this method occurs when there is an incomplete array. An incomplete array is one that has values < .02 of the row sum. This may happen for many reasons such as low variance between the participant's opinions, high or low opinion held by all or most judges, or even a bimodal distribution. There are three techniques that fix the

problem. The evaluation team used the following procedure in this project.

Separate any incomplete array into several smaller complete ones. Make the smaller arrays complete by collapsing columns as needed. Then scale these arrays on the corresponding values of the largest array to ensure the scaling is consistent. This technique insures that no instances or boundaries are unscaled.

### 3. Example Problem

An example problem is provided in Appendix A to show the reader how the evaluation team used Professor Lindsay's technique.

C. MAKING THE RESULTS "FRIENDLY" TO A DECISION MAKER

This step required plotting the instances and the categories on a simple line graph depicted in Figure 4.

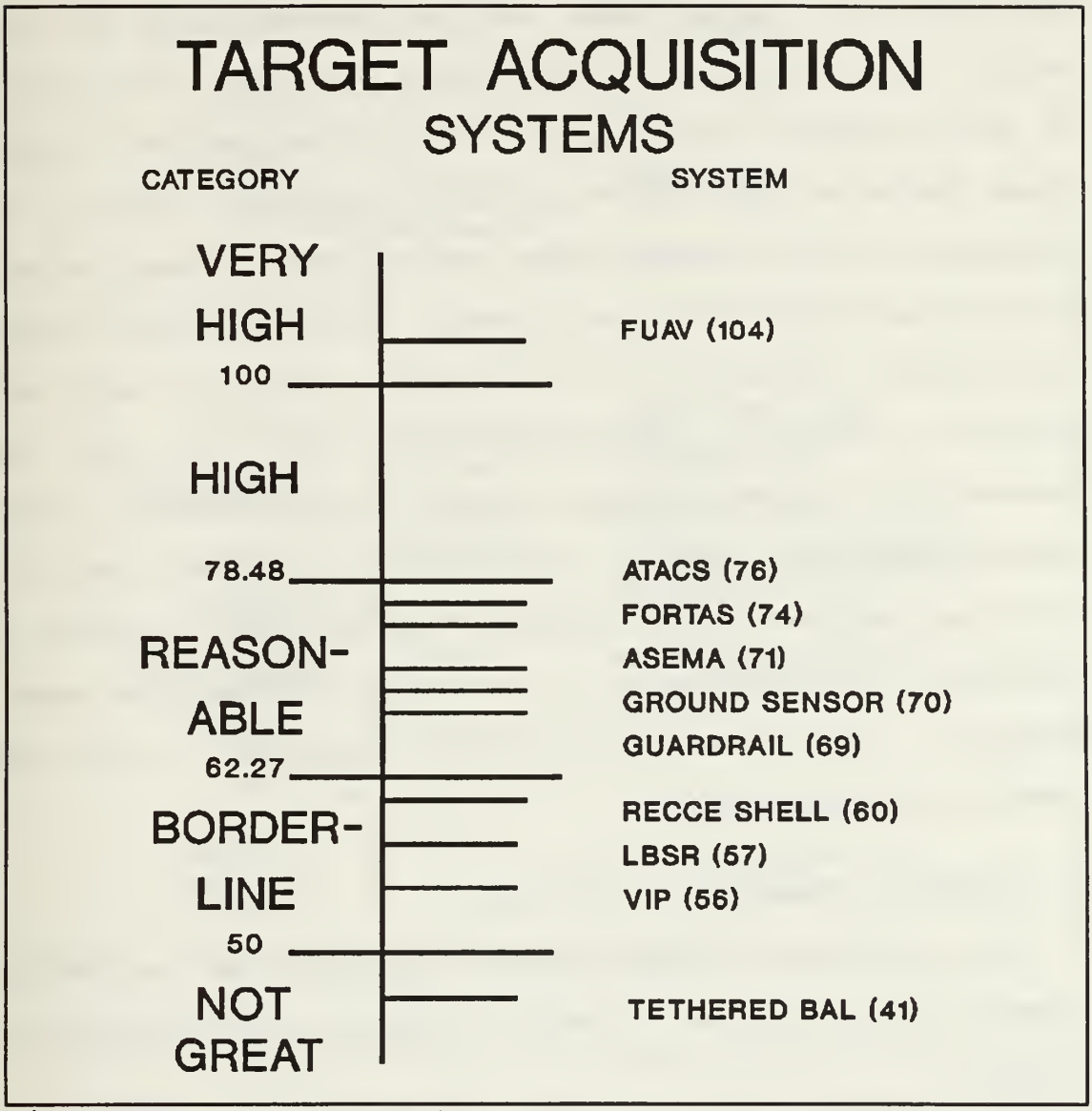



**Figure 4** Example Results

# IV RESULTS

The goal of this methodology was to portray the instances, the intervals between them, and the categories on the same scale. This methodology accomplishes this goal. The results of every question display all three items mentioned above. Since there is one figure for every question, there is the potential for 116 figures. When the different categories such as Long and Close Fires and Desert, Tropical, and Northern Continental scenarios are considered, there are many more possible figures. Displayed here are only the most interesting figures of each survey, along with one figure showing the difference in preferences in weapons systems in the Close and Long Fires scenarios, and one figure showing the difference in preferences in munitions between the Desert, Tropical, and Northern Continental scenarios. All other results are in Appendix E.

## A. SURVEY 1 (TARGET ACQUISITION)

The following figure (Figure 5) depicts results from the stimulus requiring participants to assess target acquisition systems.

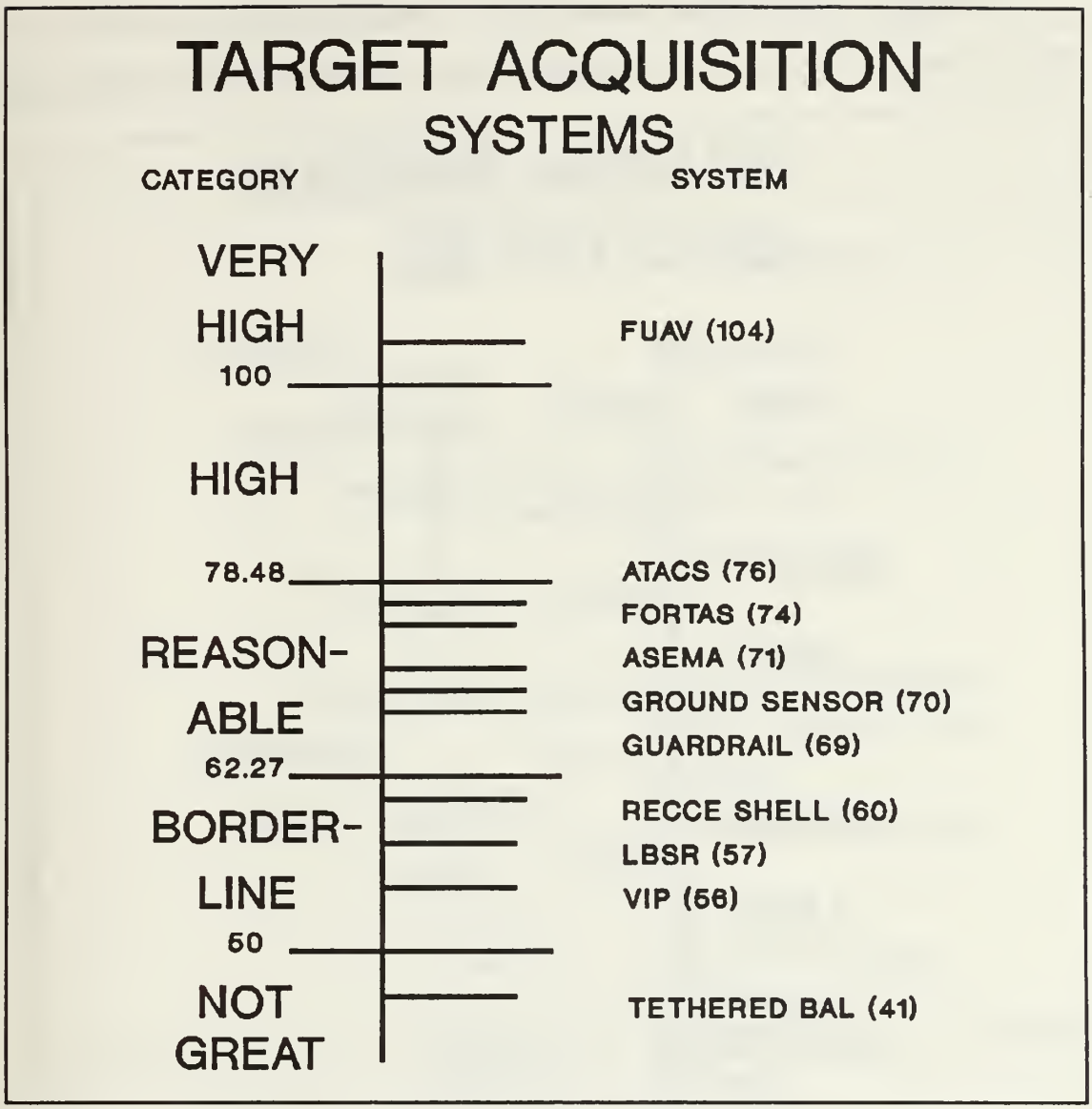



**Figure 5** Target Acquisition Systems

These results quickly show that the FUAV is not only considered the best system, but it is one entire category removed from other systems.

B. SURVEY 2 (WEAPONS)

Figure 6 shows the results of response 18, the stimulus requiring participants to assess the proposed weapon systems.

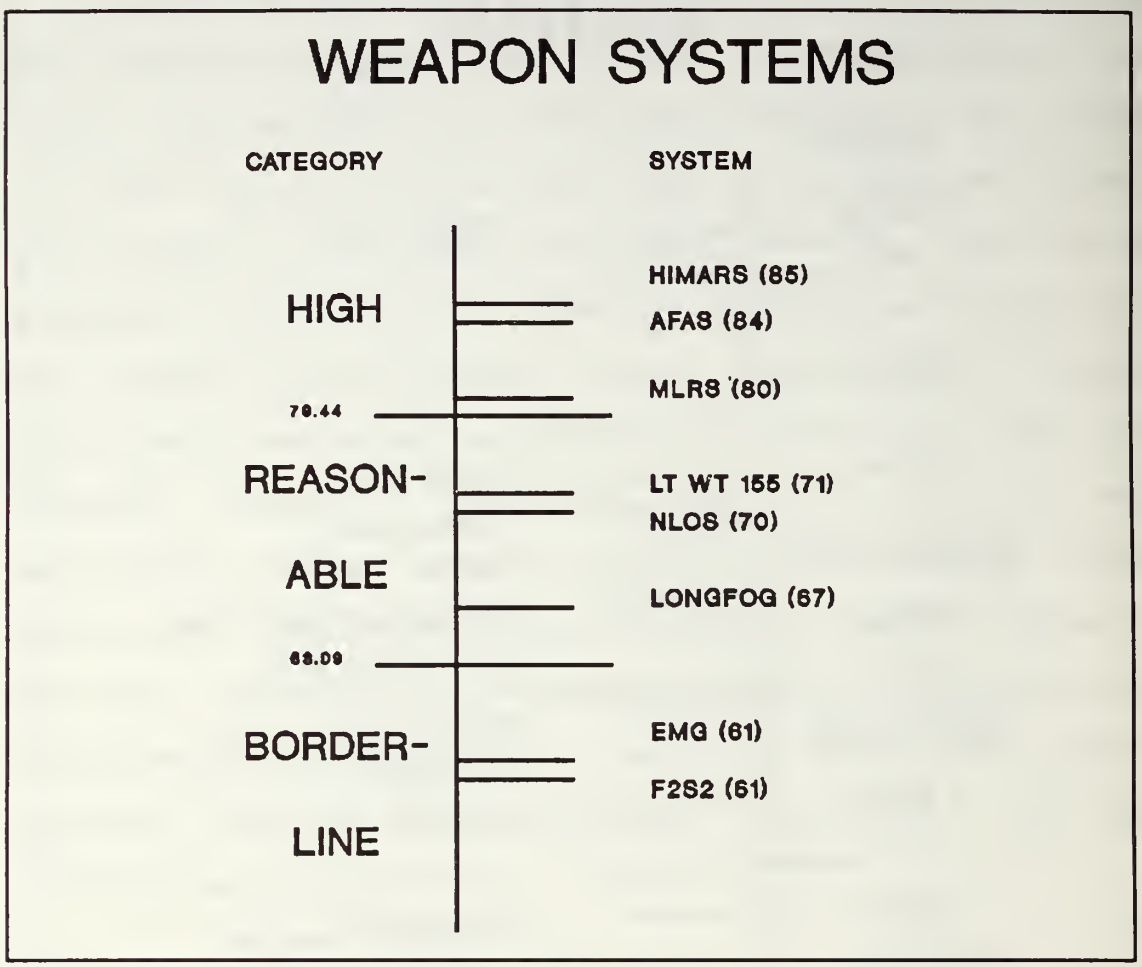



Figure 6 Weapon Systems

There appear to be five winners, with three in the "high" category and two others very close. The EMG result, however, was the interesting result. With all the talk about the EMG recently, it was a surprise to see it ranked so low.

C. SURVEY 2 (MUNITIONS)

The following figure (Figure 7) shows the results of the munitions assessments.

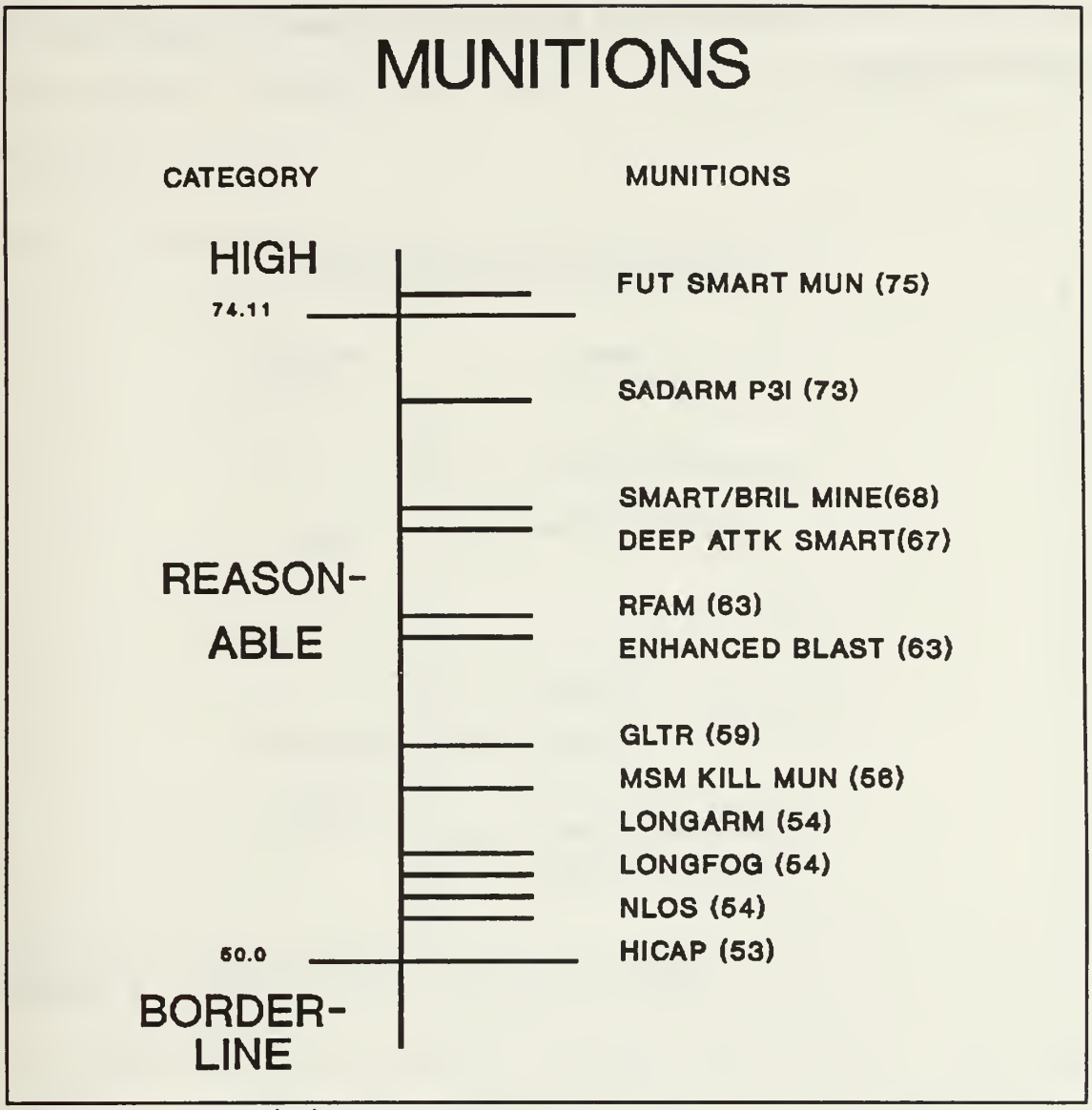



Figure 7 Munitions

The Future Smart Munition is the best here, but it is just barely in the "high" category. All other systems are in the "reasonable category", which seems to imply that there are many differing views on which system will be needed in the future. The scenarios comparison sheds light on this observation.

## D. SURVEY 3 (COMMAND AND CONTROL)

Figure 8 displays how the participants assessed the systems on the last stimulus of the survey. This stimulus required participants to indicate their strength of preference for proposed command and control systems discussed in the wargame.

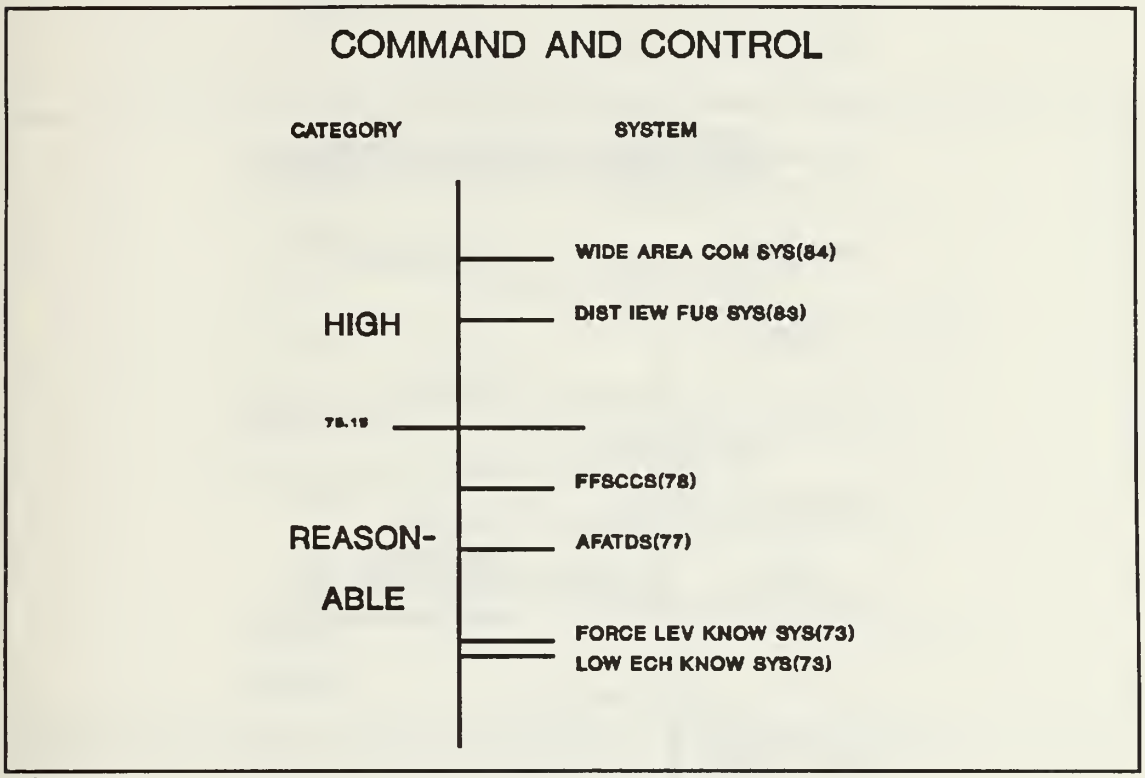



**Figure 8** Command and Control Systems

Aside from the displayed winners and losers, the figure shows that continued investment in the two Knowledge Systems appears pointless (both anchor the bottom of the scale).

## E. SURVEY 4 (SUPPORT,SUSTAINMENT, STRATEGIC DEPLOYMENT AND TACTICAL MOBILITY)

This figure (Figure 9) depicts results from response 19, the stimulus asking participants to assess support systems. Certainly, proponents of the TRAC will not like this, but when a decision maker sees this, he has no problem seeing which system is deficient.

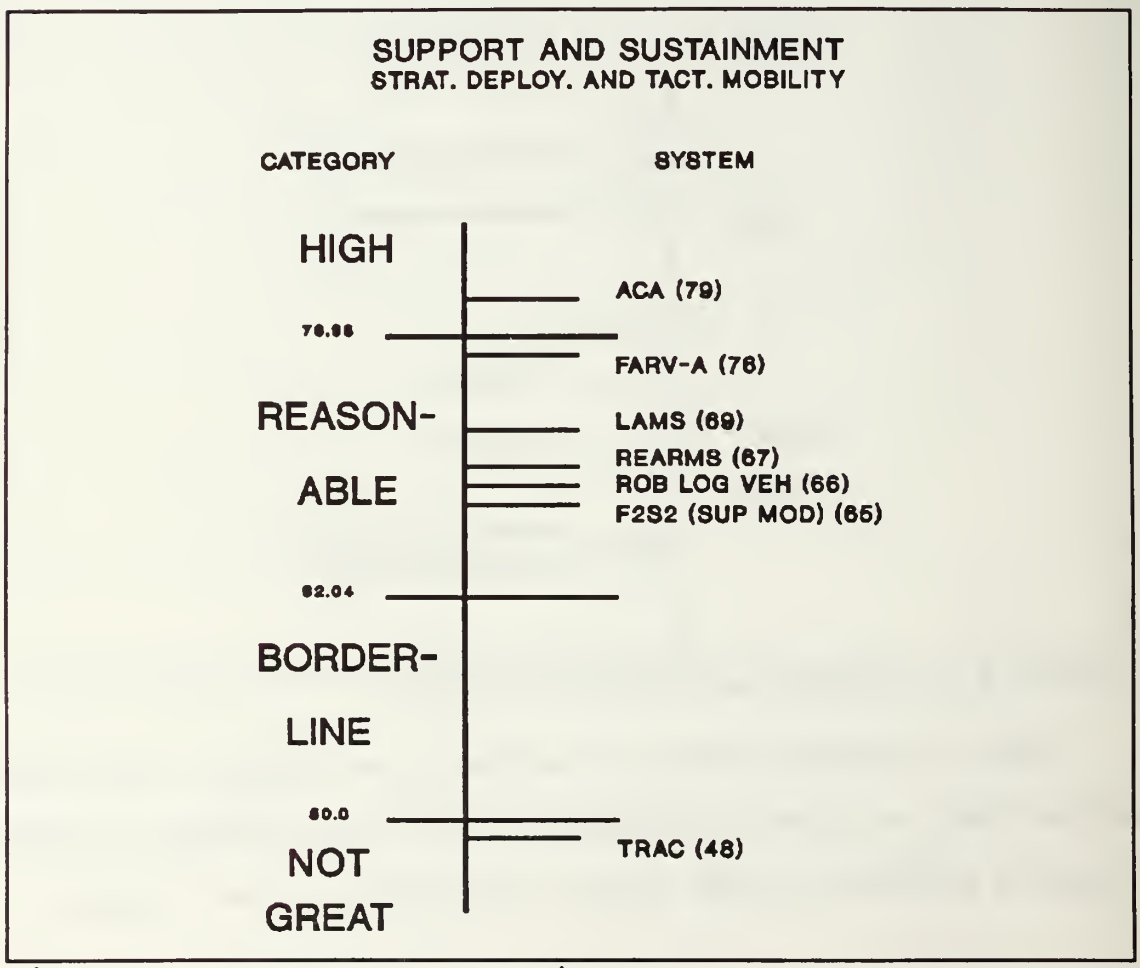



Figure 9 Support and Sustainment Systems

## F. SURVEY 5 (FUTURE COMBAT CHARACTERISTICS)

Figure 10 shows results from the stimulus concerning fire support systems.

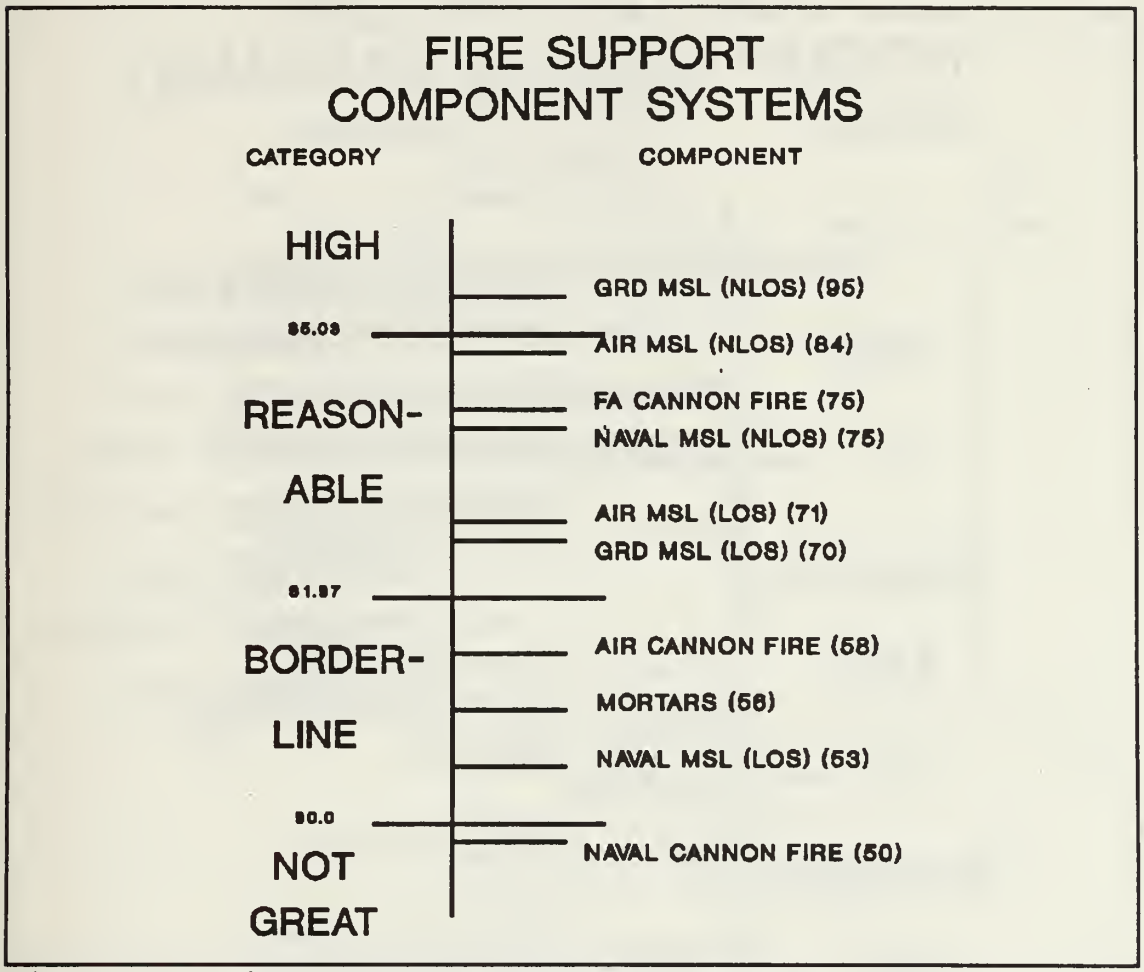



**Figure 10** Fire Support Component Systems

NLOS systems are obviously the best, making up three of the top four systems. Interestingly Naval systems fared very poorly (except for the NLOS system), possibly adding rationale to the decision to retire battleships.

## G. SURVEY 6 (PAST WARGAME TRENDS)

The following results (Figure 11) are from the stimulus concerning the importance of the Top Ten Systems.

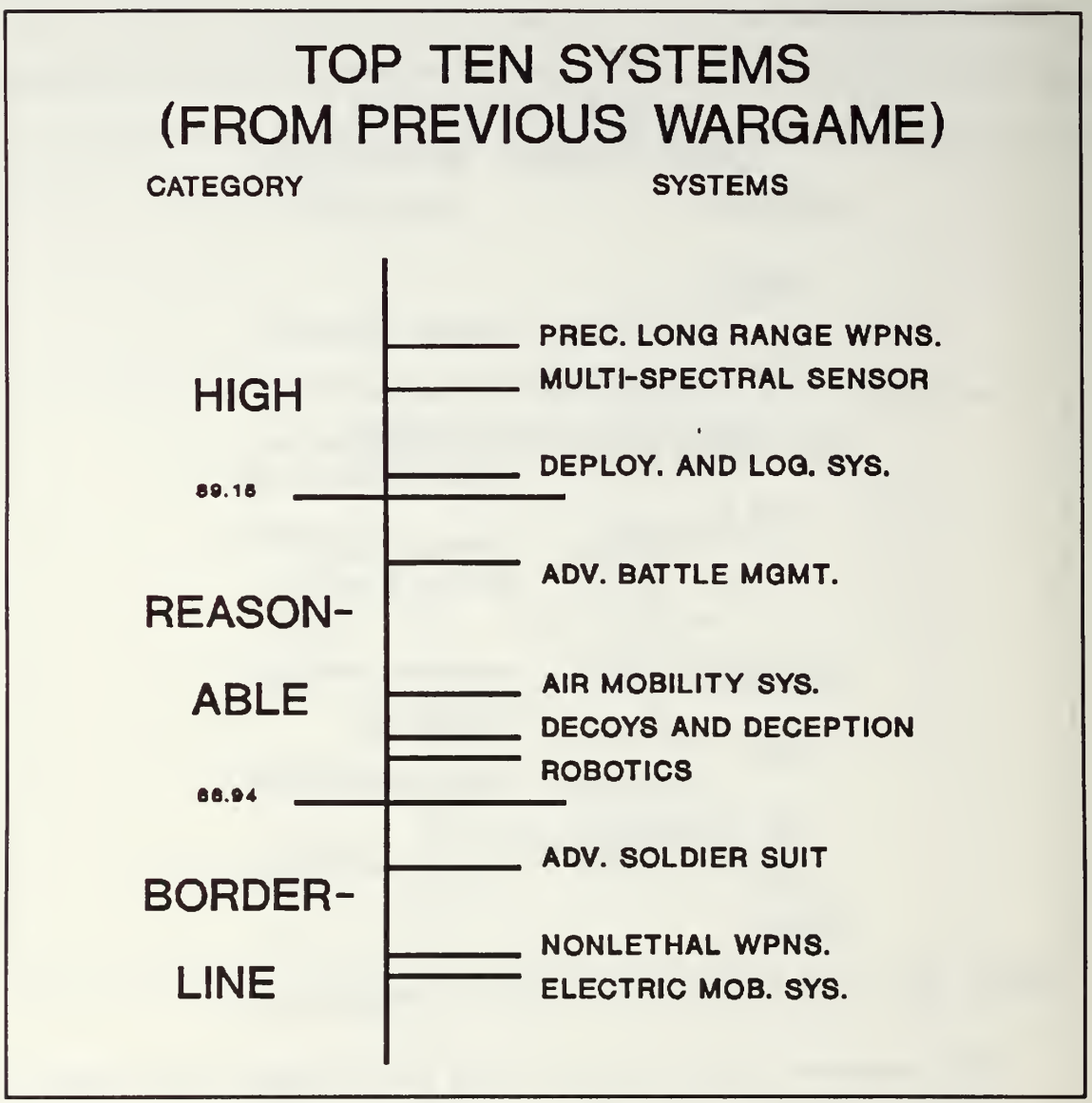



Figure 11 Top Ten Systems

The organizers of the next TBSW may want to change the Top Ten Systems to the Top Seven Systems after considering these results.

## H. CLOSE VERSUS LONG FIRES

Figure 12 is a comparison of weapon systems as judged in Close and Long fires scenarios.

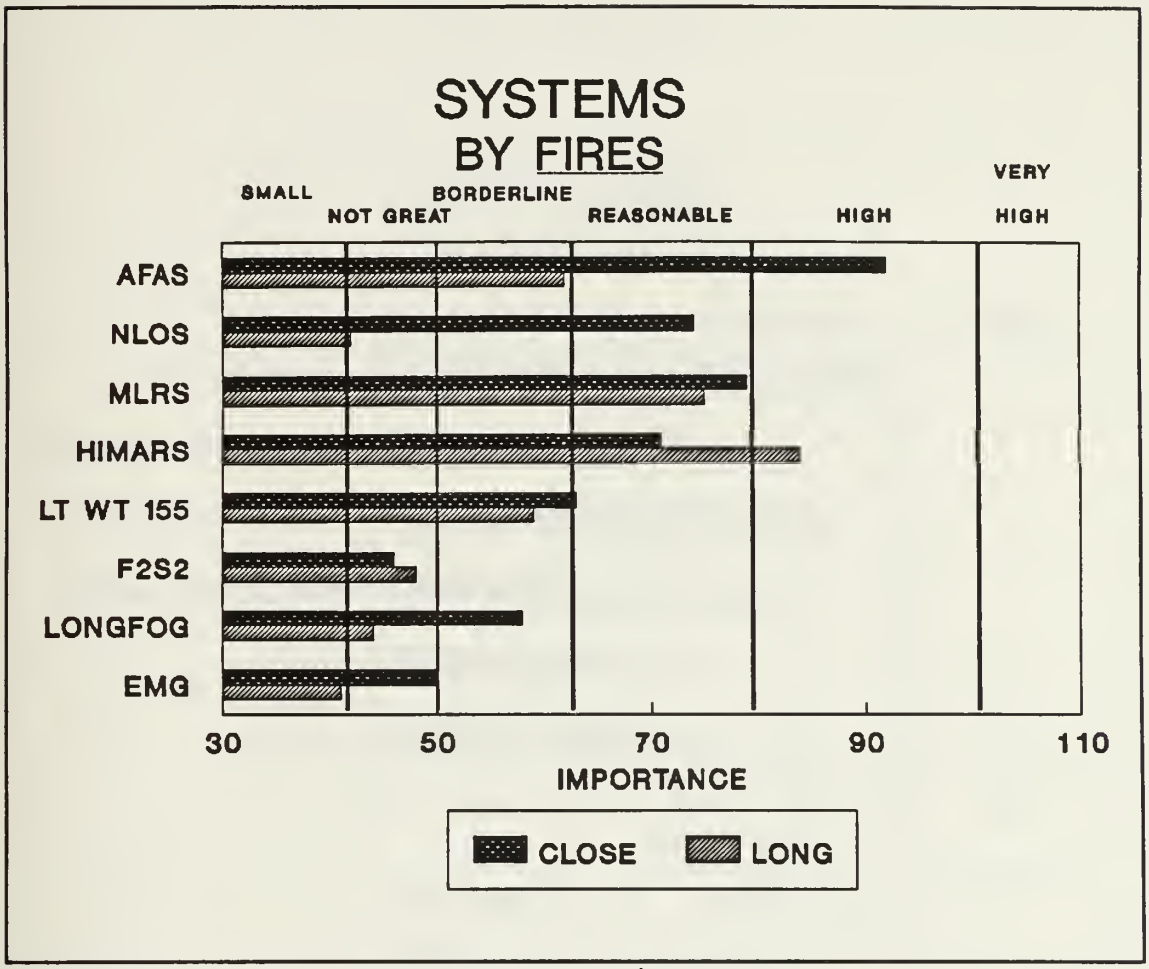



**Figure 12** Weapon Systems Comparison

This figure displays the need for several systems since one system will not meet all the needs in all the cases. For example, NLOS is the third best system and in the "high" category when in a Close fire scenario, but drops to next to

last and the "borderline" category when in the Long fire scenario.

## I. DESERT VERSUS JUNGLE VERSUS NORTHERN CONTINENTAL SCENARIOS

The following two figures (Figures 13 and 14) show the comparison of 12 munitions (6 per figure) in different scenarios.

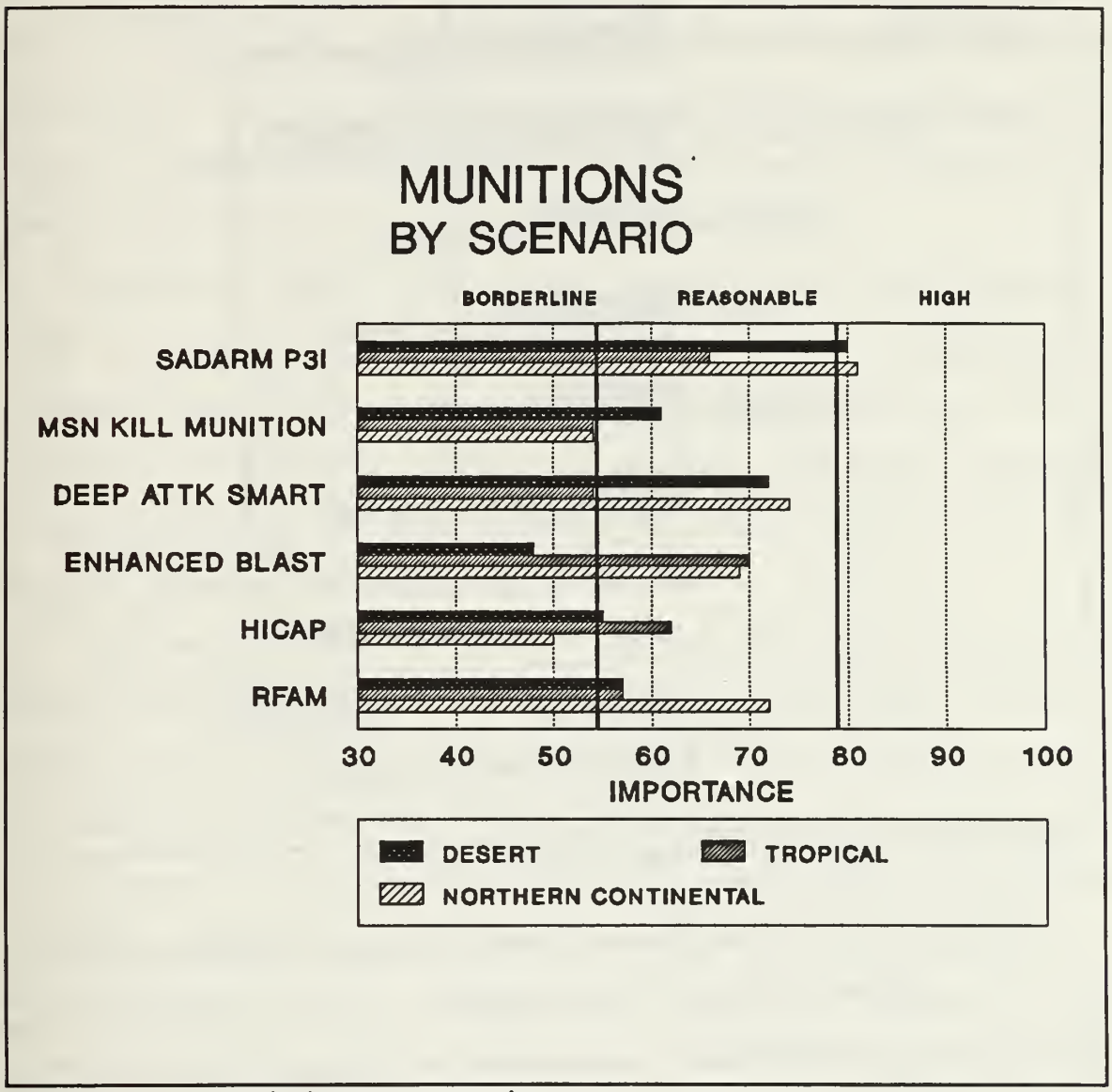



**Figure 13** Munitions Comparison 1

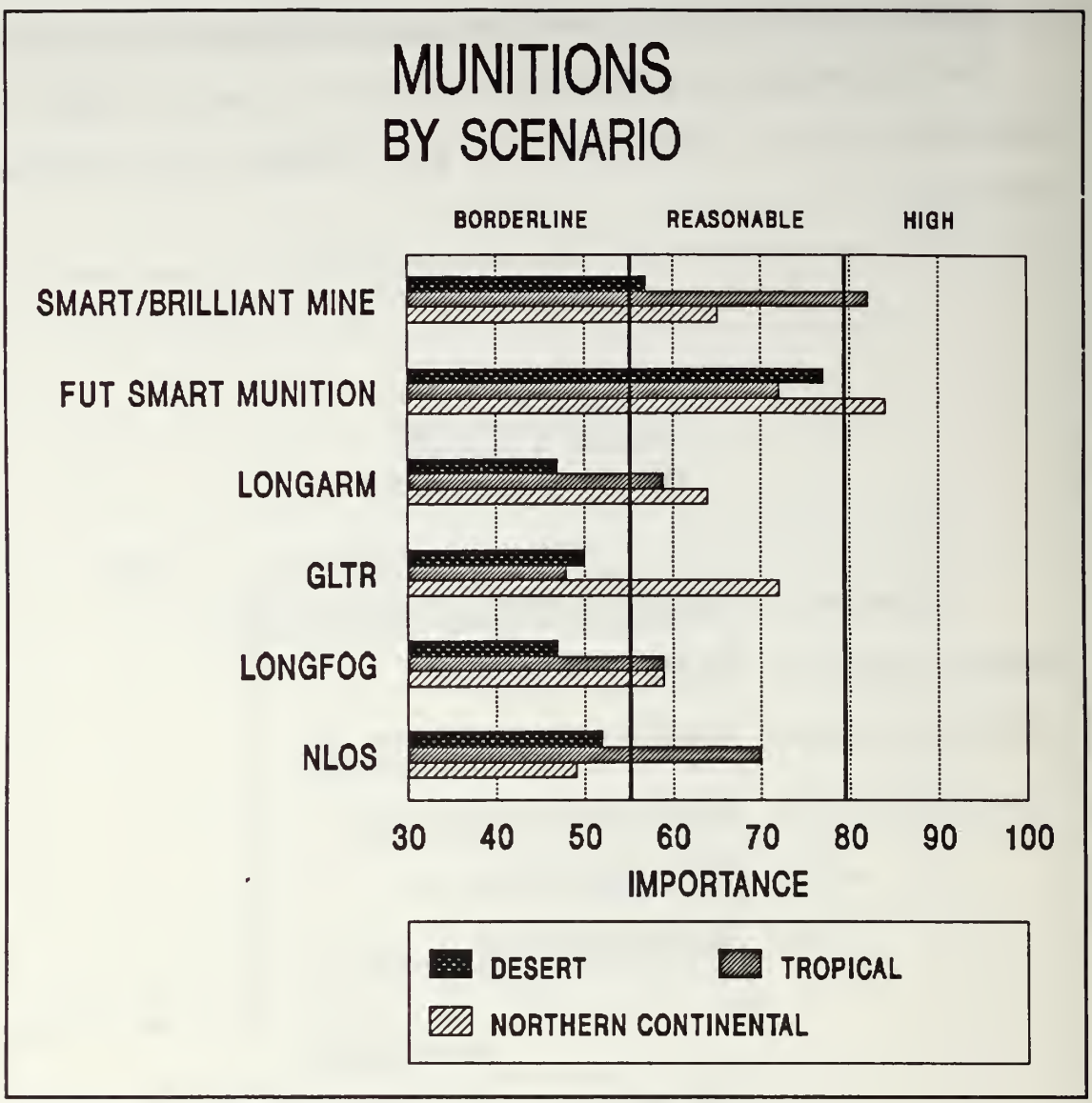



Figure 14 Munitions Comparison 2

The key point from these figures is that one munition will not be great in all scenarios. For instance, the Smart/Brilliant Mine is the number one system and is in the "high" category in the Tropical scenario, but it drops to sixth in the Desert scenario and is barely in the "reasonable" category.

# V. CONCLUSIONS AND RECOMMENDATIONS

Analysis of each survey and the different groups that participated in the surveys using this methodology provided much insight into future technologies and systems. The methodology also provided graphical results that are friendly to even the most mathematically inhibited decision maker. The individual survey conclusions are as follows.

The Target Acquisition survey participants considered the FUAV the best system in which to invest. Participants expressed this view in every response except one, and in that response the FUAV was judged number two. The final response result, Figure 5, makes a very strong point, showing the FUAV in the "very high" category by itself.

The results from the Weapons Systems and Munitions survey showed that several systems and munitions are highly valued. Five of the 8 weapon systems and 6 of the 10 munitions held the top position at least once in the survey. Combined with the figures of Long versus Close Fire comparisons of weapons systems, Figure 12, and of Scenario comparisons of munitions, Figures 13 and 14, the notion that one system, whether it be a weapons system firing platform or munition, meets all the current requirements in all the possible scenarios is discarded.

Participants in the Command and Control survey considered two systems (Wide Area Communication System and the Distributed IEW Fusion System) the prime movers in this field. Probably just as important, in each of the twenty responses except one, the two Knowledge Systems were judged as least useful.

The results of the final Support, Sustainment, Strategic Deployability and Tactical Mobility survey response, Figure 9, is very representative of all the responses. The highest judged system changes with the characteristics, but in every response the TRAC is judged worst.

From the LABCOM perspective, the results are not as clear cut. Survey 5 (Combat Power) shows future trends in many areas, as follows:

1. Passive target detection is very important and active target detection is not. This is very interesting considering most Army systems use active detectors.

2. Strategic deployability is more important than either operational deployability or taactical mobility, which implies that getting there is more important than what happens once on the ground.

3. NLOS systems are the firepower systems of the future; mortars are not.

Survey 6 (Emerging Technologies and Systems) results focus on two areas. These results show that Advanced Signal Processing/Computing and Protection/Lethality technologies along with Precision Long Range Weapons and Multi-Spectral Sensor/Fusion systems are judged the technologies of the future. At the other end of the spectrum, the number of

emerging technologies could shrink from 13 to 11 and the number of emerging systems from 10 to 7. The next wargame sponsor could drop Biotechnology and Neuroscience technologies and Advanced Soldier Suit, Nonlethal Weapons, and Electric Ground Mobility systems from the lists of those considered.

The survey design of the first four surveys is very similar with the only real difference being their area of focus and the resulting change in characteristics and systems. Since many of the characteristics evaluated were the same in all four of the surveys it would have been easy to generalize across the characteristics. The evaluation team was careful not to do this however. For example, in the support and sustainment scenarios tactical mobility was more important than strategic deployability, but in weapons systems scenarios the trend was reversed. In target acquition scenarios range under 60 kilometers was most important, but in the weapons systems scenarios range out to 100 kilometers was just as important.

Apart from the individual surveys, the methodology provides a tremendous improvement of obtaining and portraying results over previous TBSWs. USAFAS was pleased with the results and wants a follow up briefing to their new Commanding General. TRAC-Monterey will use the methodology during the next LABCOM TBSW in the fall of 1991. There are, however, some improvements that can be made.

These improvements include closer working relationships with the proponent agencies during the survey development. USAFAS played an integral part in the survey design and consequently received much from the results. Unintentionally but unfortunately, the same cannot be said of the results for LABCOM. Reduction in the number of characteristics per each type of survey to seven would reduce the number of questions per survey and increase the precision of the results. Another improvement would be automation of the data transfer from the surveys to a computer program. An optical scanner would reduce this workload significantly.

This methodology in its current form is a significant improvement over past analysis efforts of TBSWs. Decision makers receive instance values, intervals between values, and category bounds which are all helpful in making decisions. As long as the decision maker recalls that the TBSW participants consider costs of each system, the technological risk of developing each system, and the cost of the technology for each system the same, he has a very useful tool with which to make decisions on the combat effectiveness of each system. With the above listed improvements, the methodology will not only provide useful results, but the results will be timely and have more precision.

## LIST OF REFERENCES


1. United States Army Material Command, "Report on the Technology Base Seminar Wargame II, TBSWIG II 2015", 16 November 1990.

2. Department of the Army, "Operations", FM 100-5, May 1986.

3. Ministry of Defense, "The Army Field Manual Volume I The Fundamentals Part 1 The Application of Force", 1985.

4. Department of the Army, "Army Technology Base Master Plan (Draft)", 1990.

5. Torgerson, W.S., "Theory and Methods of Scaling", John Wiley & Sons,Inc., 1958.

6. United States Army Research Institute for the Behavioral and Social Sciences, "Questionnaire Construction Manual", 1976.

7. United States General Accounting Office, "Developing and Using Questions", July 1986.

8. Beyth-Marom, Beth, "How Probable is Probable? A Numerical Translation of Verbal Probability Expressions", Journal of Forecasting, Vol. 1, John Wiley and Sons, Ltd., 1982.

9. Lindsay, Glenn F., "Using Data Resulting From Categorical Judgments", Naval Postgraduate School, Monterey, CA., September 1981.

# APPENDIX A EXAMPLE PROBLEM

The following is an example of how the evaluation team used Professor Lindsay's technique. The data comes from the Target Acquisition Survey, Stimulus 21. This stimulus required participants to indicate their strength of preference for proposed target acquisition systems that were discussed during the wargame.

The first step is to count the frequency of responses in each category for each instance and build the frequency array as shown in Table 1.

TABLE 1. INITIAL FREQUENCY OF RESPONSES

| SYSTEM | VERY SMALL | SMALL | NOT GREAT | BORDER-LINE | REASON-ABLE | HIGH | VERY HIGH |
|---|---|---|---|---|---|---|---|
| ATACS | 2 | 8 | 3 | 12 | 22 | 13 | 15 |
| FORTAS | 1 | 2 | 4 | 10 | 16 | 18 | 2 |
| VIP | 8 | 2 | 16 | 15 | 11 | 10 | 2 |
| RECCE SHELL | 16 | 5 | 5 | 17 | 16 | 10 | 5 |
| TETHERED BALLOON | 23 | 9 | 14 | 15 | 8 | 2 | 0 |
| ASEMA | 4 | 2 | 2 | 10 | 17 | 25 | 6 |
| FUAV | 0 | 2 | 0 | 1 | 13 | 18 | 41 |
| GUARD-RAIL | 3 | 3 | 8 | 8 | 23 | 21 | 5 |
| GRD SENSOR | 3 | 1 | 8 | 15 | 23 | 16 | 3 |
| LBSR | 5 | 9 | 14 | 15 | 18 | 10 | 0 |

Next find the relative frequencies by dividing each cell by the row total, this result is shown in Table 2.

TABLE 2. RELATIVE FREQUENCIES

| SYSTEM | VERY SMALL | SMALL | NOT GREAT | BORDER-LINE | REASON-ABLE | HIGH | VERY HIGH |
|---|---|---|---|---|---|---|---|
| ATACS | .0280 | .056 | .042 | .169 | .310 | .183 | .211 |
| FORTAS | .014 | .113 | .056 | .197 | .268 | .254 | .099 |
| VIP | .116 | .101 | .232 | .217 | .159 | .145 | .029 |
| RECCE SHELL | .141 | .070 | .113 | .239 | .225 | .141 | .070 |
| TETHERED BALLOON | .324 | .127 | .197 | .211 | .113 | .028 | 0.00 |
| ASEMA | .056 | .028 | .099 | .141 | .239 | .352 | .085 |
| FUAV | .014 | 0.000 | 0.000 | .014 | .176 | .243 | .554 |
| GUARD-RAIL | .042 | .042 | .125 | .111 | .319 | .292 | .069 |
| GRD SENSOR | .042 | .014 | .069 | .208 | .403 | .222 | .042 |
| LBSR | .070 | .127 | .197 | .211 | .254 | .141 | 0.00 |

Once the frequency chart is complete, construct the cumulative frequency chart by summing across the rows and placing the current total in each cell as it is added. This

number is called $p_{ij}$. Table 3 shows the cumulative frequencies.

TABLE 3. CUMULATIVE FREQUENCIES

| SYSTEM | VERY SMALL | SMALL | NOT GREAT | BORDER-LINE | REASON-ABLE | HIGH | VERY HIGH |
|---|---|---|---|---|---|---|---|
| ATACS | .0280 | .084 | .126 | .295 | .605 | .788 | 1.00 |
| FORTAS | .014 | .127 | .183 | .380 | .648 | .902 | 1.00 |
| VIP | .116 | .217 | .449 | .666 | .825 | .970 | 1.00 |
| RECCE SHELL | .141 | .211 | .324 | .563 | .788 | .929 | 1.00 |
| TETHERED BALLOON | .324 | .451 | .648 | .859 | .972 | 1.00 | 1.00 |
| ASEMA | .056 | .084 | .183 | .324 | .563 | .915 | 1.00 |
| FUAV | .014 | .0140 | .0140 | .028 | .204 | .447 | 1.00 |
| GUARD-RAIL | .042 | .084 | .209 | .320 | .639 | .931 | 1.00 |
| GRD SENSOR | .042 | .056 | .125 | .333 | .736 | .958 | 1.00 . |
| LBSR | .070 | .197 | .394 | .605 | .859 | 1.00 | 1.00 |

Now remove all values of $p_{ij} > .98$ and $< .02$. Drop the last column because all its values exceed .98. Combine all cells

that are too small with cells to their right until a value greater than .02 is achieved. Drop any cells and all cells to the right that still have a value greater than .98. Because some rows now have fewer columns than other rows, the array is incomplete. Now split the original array into the following four arrays (referred to as Set 1 through 4 in Tables 4 through 7), each array with the same number of columns and the same categories.

**TABLE 4. REMOVE $P_{ij}$ < .02 OR > .98, SET 1**

| SYSTEM | VERY SMALL | SMALL | NOT GREAT | BORDER-LINE | REASON-ABLE | HIGH |
|---|---|---|---|---|---|---|
| ATACS | .0280 | .084 | .126 | .295 | .605 | .788 |
| VIP | .116 | .217 | .449 | .684 | .825 | .970 |
| RECCE SHELL | .141 | .211 | .324 | .563 | .788 | .929 |
| ASEMA | .605 | .084 | .183 | .324 | .563 | .915 |
| GUARD-RAIL | .042 | .084 | .209 | .320 | .639 | .931 |

TABLE 5. REMOVE $P_{ij}$ < .02 OR > .98, SET 2

| SYSTEM | SMALL | NOT GREAT | BORDER-LINE | REASON-ABLE | HIGH |
|---|---|---|---|---|---|
| FORTAS | .141 | .183 | .380 | .648 | .902 |
| GRD SENSOR | .098 | .125 | .333 | .736 | .958 |

TABLE 6. REMOVE $P_{ij}$ < .02 OR .98, SET 3

| SYSTEM | VERY SMALL | SMALL | NOT GREAT | BORDER-LINE | REASON-ABLE |
|---|---|---|---|---|---|
| TETHERED BALLOON | .324 | .451 | .648 | .859 | .972 |
| LBSR | .070 | .197 | .394 | .605 | .859 |

TABLE 7. $P_{ij}$ < .02 OR > .98, SET 4

| SYSTEM | BORDER-LINE | REASON-ABLE | HIGH |
|---|---|---|---|
| FUAV | .028 | .204 | .447 |

Notice there are no values of $p_{ij}$ > .98 or < .02 in any table.

Use the p values to find the corresponding z value from the Normal Distribution tables. Tables 8 through 11 display the z values.

TABLE 8. NORMALIZED SET 1

| SYSTEM | VERY SMALL | SMALL | NOT GREAT | BORDER-LINE | REASON-ABLE | HIGH |
|---|---|---|---|---|---|---|
| ATACS | -1.91 | -1.39 | -1.13 | -.54 | .27 | .80 |
| VIP | -1.20 | -.78 | -.13 | .43 | .94 | 1.88 |
| RECCE SHELL | -1.18 | -.13 | -.46 | .14 | .94 | 1.47 |
| ASEMA | -2.54 | -2.39 | -.90 | -.46 | .16 | 1.88 |
| GUARD-RAIL | -2.64 | -2.39 | -.81 | -.47 | .36 | 1.48 |

TABLE 9. NORMALIZED SET 2

| SYSTEM | SMALL | NOT GREAT | BORDER-LINE | REASON-ABLE | HIGH |
|---|---|---|---|---|---|
| FORTAS | -1.08 | -.90 | -.31 | .38 | 1.29 |
| GRD SENSOR | -1.29 | -1.15 | -.43 | .63 | 1.73 |

TABLE 10. NORMALIZED SET 3

| SYSTEM | VERY SMALL | SMALL | NOT GREAT | BORDER-LINE | REASON-ABLE |
|---|---|---|---|---|---|
| TETHERED BALLOON | -.46 | -.12 | .38 | 1.08 | 1.91 |
| LBSR | -1.48 | -.85 | -.27 | .27 | 1.08 |

TABLE 11. NORMALIZED SET 4

| SYSTEM | BORDER-LINE | REASON-ABLE | HIGH |
|---|---|---|---|
| FUAV | -1.91 | -.83 | -.13 |

Compute the column averages, $b_j$ and the grand average, $\bar{b}$. Tables 12 through 15 show these results.

TABLE 12. CATEGORY BOUNDS, SET 1

| SYSTEM | VERY SMALL | SMALL | NOT GREAT | BORDER -LINE | REASON -ABLE | HIGH | ROW TOTAL | ROW AVERAGE ($\bar{z}_i$) |
|---|---|---|---|---|---|---|---|---|
| ATACS | -1.91 | -1.39 | -1.13 | -.54 | .27 | .80 | -3.9 | -.65 |
| VIP | -1.20 | -.78 | -.13 | .43 | .94 | 1.88 | 1.14 | .19 |
| RECCE SHELL | -1.18 | -.80 | -.46 | .14 | .36 | 1.48 | -.03 | -.005 |
| ASEMA | -2.54 | -2.39 | -.90 | -.46 | .16 | 1.37 | -4.76 | -.79 |
| GUARD-RAIL | -2.64 | -2.39 | -.81 | -.47 | .36 | 1.48 | -4.47 | -.745 |
| COLUMN TOTALS | -9.47 | -7.75 | -3.43 | -.90 | -.90 | 7.00 | GRAND AVERAGE: $\bar{b}$ = -.401 | |
| COLUMN AVERAGES: $b_j$ | -1.89 | -1.55 | -.69 | -.18 | .506 | 1.40 | | |

TABLE 13. CATEGORY BOUNDS, SET 2

| SYSTEM | SMALL | NOT GREAT | BORDER -LINE | REASON -ABLE | HIGH | ROW TOTAL | ROW AVERAGE ($\bar{z}_i$) |
|---|---|---|---|---|---|---|---|
| FORTAS | -1.08 | -.90 | -.31 | .38 | 1.29 | -.62 | -.124 |
| GRD SENSOR | -1.08 | -1.15 | -.43 | .63 | 1.29 | -.51 | -.102 |
| COLUMN TOTALS | -2.39 | -2.05 | -.74 | -.81 | 3.02 | GRAND AVERAGE: $\bar{b}$ = -.115 | |
| COLUMN AVERAGES: $b_j$ | -1.195 | -1.025 | -.370 | .505 | 1.51 | | |

TABLE 14. CATEGORY BOUNDS, SET 3

| SYSTEM | VERY SMALL | SMALL | NOT GREAT | BORDER -LINE | REASO N- ABLE | ROW TOTAL | ROW AVERA GE |
|---|---|---|---|---|---|---|---|
| | | | | | | | $(\bar{z}_i)$ |
| TETHERED BALLOON | -.46 | -.12 | .38 | 1.08 | 1.91 | 2.79 | .558 |
| LBSR | -1.48 | -.85 | -.27 | .27 | 1.08 | -1.25 | -.25 |
| COLUMN TOTALS | -1.94 | -.97 | .11 | 1.35 | .558 | GRAND AVERAGE: $\bar{b}$ = .147 | |
| COLUMN AVERAGES: $b_j$ | -.97 | -.485 | .055 | .675 | 1.459 | | |

TABLE 15. CATEGORY BOUNDS, SET 4

| SYSTEM | BORDER -LINE | REASON -ABLE | HIGH | ROW TOTAL | ROW AVERAGE ($\bar{z}_i$) |
|---|---|---|---|---|---|
| FUAV | -1.91 | -.83 | -.13 | -2.87 | -.957 |
| COLUMN AVERAGE: $b_j$ | -1.91 | -.83 | -.13 | GRAND AVERAGE: $\bar{b}$ = -.957 | |

The category boundaries from each set are summarized in Table 16.

TABLE 16. UPPER BOUNDS

| SET | VERY SMALL | SMALL | NOT GREAT | BORDER-LINE | REASON -ABLE | HIGH |
|---|---|---|---|---|---|---|
| 1 | -1.89 | -1.55 | -.69 | -.18 | .506 | 1.40 |
| 2 | NA | -1.195 | -1.025 | -.370 | .506 | 1.51 |
| 3 | -.97 | -.485 | .055 | .675 | 1.459 | NA |
| 4 | NA | NA | NA | -1.91 | -.83 | -.13 |

To get the scaled instance value, solve the following equation.

$$S_i = \bar{b} - \overline{Z_i}\sqrt{\frac{B}{A_i}}$$

To solve this equation, the variables $A_i$ and B need to be calculated. Obtain $A_i$ from the following equation,

$$A_i = \sum_{j=1}^{m-k} (Z_{ij} - \overline{Z_i})^2 \quad .$$

The results of this calculation are displayed in Tables 17 through 20.

TABLE 17. ROW SUM OF SQUARES DIFFERENCE, SET 1

$$A_i = \sum_{j=1}^{m-k} (Z_{ij} - \overline{Z_i})^2$$

| SYSTEM | VERY SMALL | SMALL | NOT GREAT | BORDER -LINE | REASON -ABLE | HIGH | $\overline{Z_j}$ | $A_i$ |
|---|---|---|---|---|---|---|---|---|
| ATACS | -1.91 | -1.39 | -1.13 | -.54 | .27 | .80 | -.65 | 5.326 |
| VIP | -1.20 | -.78 | -.13 | .43 | .94 | 1.88 | .19 | 6.453 |
| RECCE SHELL | -1.18 | -.80 | -.46 | .14 | .80 | 1.47 | .01 | 5.064 |
| ASEMA | -2.54 | -2.39 | -.90 | -.46 | .16 | 1.37 | -.79 | 11.316 |
| GUARD-RAIL | -2.64 | -2.39 | -.81 | -.47 | .36 | 1.48 | -.75 | 12.549 |

TABLE 18. ROW SUM OF SQUARES DIFFERENCE, SET 2

$$A_i = \sum_{j=1}^{m-k} (Z_{ij} - \overline{Z_i})^2$$

| SYSTEM | SMALL | NOT GREAT | BORDER -LINE | REASON -ABLE | HIGH | $\overline{Z_j}$ | $A_i$ |
|---|---|---|---|---|---|---|---|
| FORTAS | -1.08 | -.90 | -.31 | .38 | 1.29 | -.124 | 3.804 |
| GRD SENSOR | -1.29 | -1.15 | -.43 | .63 | 1.73 | -1.02 | 10.723 |

TABLE 19. ROW SUM OF SQUARES DIFFERENCE, SET 3

$$A_i = \sum_{j=1}^{m-k} (Z_{ij} - \overline{Z_i})^2$$

| SYSTEM | VERY SMALL | SMALL | NOT GREAT | BORDER -LINE | REASON -ABLE | $\overline{Z_j}$ | $A_i$ |
|---|---|---|---|---|---|---|---|
| TETHERED BALLOON | -.46 | -.12 | .38 | 1.08 | 1.91 | .558 | 3.628 |
| LBSR | -1.48 | -.85 | -.27 | .27 | 1.08 | -.250 | 3.913 |

TABLE 20. ROW SUM OF SQUARES DIFFERENCE, SET 4

$$A_i = \sum_{j=1}^{m-k} (Z_{ij} - \overline{Z_i})^2$$

| SYSTEM | BORDER -LINE | REASON -ABLE | HIGH | $\overline{Z_j}$ | $A_i$ |
|---|---|---|---|---|---|
| FUAV | -1.91 | -.83 | -.13 | -.957 | 1.608 |

Now calculate B. The equation is listed below.

$$B = \sum_{j=1}^{m-k} (b_j - \overline{b})^2$$

Table 21 shows the resulting B for each set.

TABLE 21. RESULTING B FOR EACH SET.

| SET | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| B VALUE | 7.58 | 5.21 | 3.66 | 1.61 |

Now compute the $s_i$. The results are displayed in Tables 21 through 24.

TABLE 22. INSTANCE VALUE, SET 1

| SYSTEM | ATACS | VIP | RECCE SHELL | ASEMA | GUARD -RAIL |
|---|---|---|---|---|---|
| $S_i$ | .416 | -.450 | -.284 | .191 | .124 |

TABLE 23. INSTANCE VALUES, SET 2

| SYSTEM | FORTAS | GROUND SENSOR |
|---|---|---|
| $S_i$ | .012 | -.009 |

TABLE 24. INSTANCE VALUES, SET 3

| SYSTEM | TETHERED BALLOON | LBSR |
|---|---|---|
| $S_i$ | .412 | .398 |

TABLE 25. INSTANCE VALUES, SET 4

| SYSTEM | FUAV |
|---|---|
| $S_i$ | .01 |

Now transform the data and the bounds so that all systems and bounds are on the same scale. The evaluation team

arbitrarily chose the category bound between "high" and "very high" as 100 and the bound between "borderline" and "not great" as 50. Using the following simultaneous equations yields the results for Set 1 shown in Table 26.

$$100 = \alpha + \beta \quad ( 1.405 )$$

$$50 = \alpha + \beta \quad ( -.688 )$$

**TABLE 26. TRANSFORMED DATA, SET 1**

| SYSTEM | $s_i$ | TRANSFORMED $s_i$ |
|---|---|---|
| ATACS | .416 | 76.36 |
| VIP | -.450 | 55.69 |
| RECCE SHELL | -.284 | 59.65 |
| ASEMA | .191 | 71.00 |
| GUARD-RAIL | .124 | 69.40 |

Using the following simultaneous equations yields the results for Set 2 shown in Table 27.

$$100 = \alpha + \beta \quad ( 1.511 )$$

$$50 = \alpha + \beta \quad ( -1.027 )$$

TABLE 27. TRANSFORMED DATA, SET 2

| SYSTEM | $s_i$ | TRANSFORMED $s_i$ |
|---|---|---|
| FORTAS | .012 | 70.46 |
| GRD SENSOR | -.009 | 70.06 |

Using the following simultaneous equations yields the results for Set 3 shown in Table 28.

$$39.13 = \alpha + \beta \ ( \ -.488 \ )$$

$$50 = \alpha + \beta \ ( \ .056 \ )$$

TABLE 28. TRANSFORMED DATA, SET 3

| SYSTEM | $s_i$ | TRANSFORMED $s_i$ |
|---|---|---|
| TETHERED BALLOON | -.412 | 40.65 |
| LBSR | .398 | 56.83 |

Using the following simultaneous equations yields the results for Set 4 shown in Table 29.

$$100 = \alpha + \beta \ ( \ -.136 \ )$$

$$78.48 = \alpha + \beta \ ( \ -.832 \ )$$

TABLE 29. TRANSFORMED DATA, SET 4

| SYSTEM | $s_i$ | TRANSFORMED $s_i$ |
|---|---|---|
| FUAV | 0.00 | 104.21 |

The transformed data for all systems appears below.

TABLE 30. FINAL RANKED DATA

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| ATACS | 76.36 | 2 |
| FORTAS | 70.46 | 4 |
| VIP | 55.69 | 9 |
| RECCE SHELL | 59.65 | 7 |
| TETHERED BALLOON | 40.65 | 10 |
| ASEMA | 71.00 | 3 |
| FUAV | 104.21 | 1 |
| GUARD-RAIL | 40.65 | 6 |
| GRD SENSOR | 70.06 | 5 |
| LBSR | 56.83 | 8 |

## APPENDIX B. PARTICIPANTS

### DESERT

#### ADVISORS

| | |
|---|---|
| MAJ Boyer | CASCOM |
| MAJ Grunwald | ASL |
| Mr. Hassell | CRDEC |

#### LONG RANGE FIRES

| | |
|---|---|
| LTC Angus | USAFAS |
| Dr. Brown | ARO |
| Mr. Campi | CECOM |
| LTC De Broux | USACACDA |
| COL James | ARDEC |
| Mr. Konick | HDL |
| Mr. Lavoie | AFAU |
| MAJ Martin | ARDEC |
| MAJ Perry | USAADAS |
| CPT Peyronin | USAFAS |
| COL Pier | USAFAS |
| COL Reynolds | USAFAS |
| Mr. Youngberg | LABCOM |

#### CLOSE FIRES

| | |
|---|---|
| Dr. Cerny | CASCOM |
| Mr. Eng | ETDL |
| LTC Gemar | USAFAS |
| Mr. Gross | USAFAS |
| MAJ Hardrick | USAIS |
| Mr. Holtus | FSTC |
| Mr. Jennings | MICOM |
| LTC Jurchenko | USAFAS |
| Mr. Mermagen | BRL |
| Mr. Potthoff | AVSCOM |
| Mr. Sandmeyer | AMSAA |
| Mr. Wall | HEL |

## TROPICAL

### ADVISORS

| | |
|---|---|
| Mr. Dagostin | CRDEC |
| Dr. Duncan | ASL |
| Mr. Lee | CASCOM |

## LONG RANGE FIRES

| | |
|---|---|
| Mr. Busse | TACOM |
| Mr. Campos | FSTC |
| Dr. Deitz | BRL |
| COL Griffith | USAFAS |
| CPT Grouch | USAAVNS |
| Mr. Jackson | MICOM |
| LTC Johnson | USAFAS |
| Mr. King | AMSAA |
| MAJ Purath | CECOM |
| COL Sanchez | USAFAS |
| LTC Theaux | NRDEC |
| Mr. Tucker | USAICS |

## CLOSE FIRES

| | |
|---|---|
| LTC Adams | USASIGC |
| Ms. Aymett | MICOM |
| LTC Browers | USAFAS |
| COL Dodd | USAFAS |
| Mr. Dodd | MRDC |
| Mr. Hiatt | USAFAS |
| Mr. Keith | TACOM |
| Mr. Miller | ETDL |
| Dr. Murphy | BRL |
| LTC Myers | USAFAS |
| MAJ Rose | USAARMS |
| Mr. Wrenn | ARDEC |

## NORTHERN CONTINENTAL

### ADVISORS

| | |
|---|---|
| Mr. Beale | CASCOM |
| Mr. Blanco | ASL |
| Mr. Pierce | CRDEC |

### LONG RANGE FIRES

| | |
|---|---|
| LTC Bell | USAFAS |
| Mr. Bergman | ETL |
| LTC Boles | USACAC |
| Mr. Jerschkow | VAL |
| Mr. Morrison | BRL |
| LTC Munden | USAFAS |
| Mr. Perricelli | CECOM |
| Mr. Scarborough | AMMOLOG |
| Mr. Slife | HDL |

### CLOSE FIRES

| | |
|---|---|
| Mr. Brown | USAFAS |
| Mr. Devine | ARDEC |
| Mr. Pope | HDL |
| LTC Gibson | MICOM |
| Mr. Hambric | BRDEC |
| LTC Holgate | NRDEC |
| Mr. Kossak | TACOM |
| MAJ Raletz | CGSC |
| COL Raymont | USAOMMCS |
| COL Rolston | USAFAS |
| COL Stanley | USAFAS |
| Mr. Wood | CNVEO |

## SENIOR REVIEW PANEL

| | |
|---|---|
| MG Hallada | USAFAS |
| BG Franks | USAFAS |
| Dr. Berenson | TRADOC |
| Mr. Campi | CECOM |
| Dr. Deitz | BRL |
| Mr. Giordano | CECOM |
| Mr. Jennings | MICOM |
| Dr. McCorkle | MICOM |
| Mr. Mermagen | BRL |
| Dr. Murphy | BRL |
| Mr. Wrenn | ARDEC |

## OBSERVERS

| | |
|---|---|
| Mr. Appel | SARDA |
| LTC Mazzanti | TRADOC |
| Ms Singleton | LABCOM |
| Ms. Szkrybalo | SARDA |

## WARGAME ADVISORY GROUP

| | |
|---|---|
| Dr. Alderman | ARI |
| MAJ Hoffman | TRAC-Monterey |
| Mr. Lavoie | Air University |
| Mr. Nolan | AMSAA |
| Mr. O Stuni | ARDEC |
| Mr. Visco | MISMA |

## CONTROL

| | |
|---|---|
| MAJ Janowski | AMC |
| Ms. Van Nostrand | LABCOM |
| Mr. White | LABCOM |

## APPENDIX C. ABBREVIATIONS

| ABBREVIATION | DEFINITION |
|---|---|
| ACL | Acceleration |
| ACT | Active |
| ADV | Advanced |
| ACA | Advanced Cargo Aircraft |
| AFAS | Advance Field Artillery System |
| AFATDS | Advanced Field Artillery Tactical Data System |
| ASEMA | Advanced Special Electronic Mission Aircraft |
| ATACS | Advanced Target Acquisition Counterfire System |
| ADA | Air Defense Artillery |
| AI | Artificial Intelligence |
| AMC | Army Material Command |
| AMSAA | Army Material System Analysis Activity |
| ARDEC | Aberdeen Research and Development Center |
| ARI | Army Research Institute for Behavorial and Social Sciences |
| ARO | Army Research Office |
| ASL | Atmospheric Science Laboratory |
| ATTK | Attack |
| BAT | Battle |
| BRDEC | Belvoir Research and Development Center |
| BRL | Ballistics Research Laboratory |
| CAMO | Camouflage |
| CECOM | Communications and Electronics Command |
| CGSC | Command and General Staff School |
| CNVEO | Center for Night Vision Electrooptics |
| COM | Commonality |
| COMMO | Communication |
| CONT | Containerization |
| CRDEC | Chemical Research and Development Center |
| DEPL | Deployability |
| ELEC | Electric |
| EMG | Electro Magnetic Gun |
| ENV | Environmental |
| ETL | Engineer Topographic Laboratory |
| EW | Early Warning |
| FA | Field Artillery |
| FARV-A | Future Armored Resupply Module |

| | |
|---|---|
| FFSCCS | Future Fire Support Command and Control System |
| F2S2 | Future Fire Support |
| FORTAS | Forward Observation Remote Target Acquisition |
| FSTC | Foreign Science and Technology Center |
| FUAV | Future Unmanned Aerial Vehicle |
| GRD | Ground |
| GLTR | Ground Launched Tacit Rainbow |
| HDL | Harry Diamond Laboratory |
| HEL | Human Engineering Laboratory |
| HICAP | High Capacity Munition |
| HIMARS | High Mobility Artillery Rocket System |
| IFF | Identification Friend or Foe |
| LABCOM | Laboratory Command |
| LAUN | Launch |
| LOS | Line Of Sight |
| LOG | Logistics |
| LAMS | Logistics Air Mobility System |
| LBSR | Lightweight Battlefield Surveillance Radar |
| LONGFOG | Long Fiber-optic Guided Missile |
| M-SPEC | Multi-spectral |
| MAT | Material |
| MHE | Material Handling Equipment |
| MAX | Maximum |
| MICOM | Missile Command |
| MIN | Minimum |
| MISMA | Model Improvement and Study Management Agency |
| MSL | Missile |
| MOB | Mobility |
| MLRS | Multiple Launch Rocket System |
| MRDEC | Medical Research and Development Center |
| NLOS | Non-line Of Sight |
| NBC | Nuclear, Chemical, and Biological |
| NRDEC | Natick Research and Development Command |
| OPN | Operational |
| PAS | Passive |
| POL | Petroleum and other lubricants |
| PRE | Precision |
| PROC | Processing |
| PROT | Protection |
| REARMS | Rapidly Deployed Artillery Resupply Module |
| RFAM | Radio Frequency Attack Missile |
| ROB | Robotics |
| RES | Resupply |
| SADARM P3I | Search and Destroy Armor, Pre-planned |

| | |
|---|---|
| | Product Improvement |
| SHIP | Shipping |
| STRAT | Strategic |
| SUP | Supply |
| SUPT | Support |
| SURV | Survivability |
| SYS | System |
| RECCE | Reconnaissance |
| TAC | Tactical |
| TACOM | Tank Automotive Command |
| TRNG | Training |
| TRAC | Trajectory Realtime Analysis Closed Loop |
| TRADOC | Training and Doctrine Command |
| UNCOM | Uncommitted |
| USAADAS | U.S. Army Air Defense Artillery School |
| USAARMS | U.S. Army Armor School |
| USAAVNS | U.S. Army Aviation School |
| USAFAS | U.S. Army Field Artillery School |
| USAIS | U.S. Army Infantry School |
| USALMC | U.S. Army Logistic Management Center |
| USASIGC | U.S. Army Signal Center |
| VAL | Avionics Laboratory |
| VEH | Vehicle |
| VIP | Video Imaging Projectile |
| WPN | Weapon |
| WT | Weight |

# APPENDIX D. APL FUNCTIONS

The following functions transformed the raw data into the scaled values for this thesis . The functions were developed by Professor Glenn F. Lindsay of the Naval Postgraduate School.

The following variables are user inputs.

N = number of instances

M = number of categories

R = a vector of consecutive rows of the raw frequency array.

A. PMATRICE R

This function changes the raw data to the cumulative relative frequency array.

```
∇ PMATRICE [□] ∇
∇ PMATRICE R
[1] F←(N,M)⍴R
[2] L←⍴F
[3] N←L[1]
[4] M←L[2]
[5] F1←+\F
[6] P←⍉(M,N)⍴(F1[;M])
[7] P←F1÷P
[8] P←P[;⍳(M-1)]
[9] 'THE P MATRIX IS;'
[10] P
[11] '  '
[12] '  '
∇
```

B. NQUAN

NQUAN takes the cumulative frequency matrix and converts it to the corresponding z values.

```
▽ NQUAN[□] ▽
▽ Q←NQUAN P
[1] →L1×⍴(0<+/P=0)∨(0<-/P=1)
[2] C0←2.515517
[3] C1←0.802853
[4] C2←0.010328
[5] D1←1.432788
[6] D2←0.189269
[7] D3←0.001308
[8] PP←(P×1-V)+(1-P)×V←P≥0.5
[9] Q←T-(C0+T×(C1+T×C2))÷1+T(D1+T×(D2+D3×T←-2×⍟PP)*0.5))
[10] Q←Q×V)-Q×1-V
[12] →0
[13] L1:'SOME PROBABILITIES ARE ZERO OR ONE'
▽
```

C. CATEGORICAL

CATEGORICAL computes the bounds and scaled values.

```
▽ CATEGORICAL[□] ▽
▽ CATEGORICAL Z
[1] L←ρZ
[2] N←L[1]
[3] M←L[2]+1
[4] BOUNDS←(+⌿)÷N
[5] 'CATEGORICAL BOUNDS'
[6] BOUNDS
[7] ' '
[8] BARZ←(+/Z)÷(M-1)
[9] BBAR←(+/BOUNDS)÷(M-1)
[10] NUM←+/((BOUNDS-BBAR)*2)
[11] DEN←((M-1),N)ρBARZ)
[12] DEN←+/((Z-DEN)*2)
[13] SD←(NUM×(÷DEN))*0.5
[14] 'STANDARD DEVIATIONS ARE:'
[15] SD
[16] ' '
[17] S←BBAR-(SD×BARZ)
[18] ' '
[19] 'INSTANCE SCALE VALUES ARE:'
[20] ' '
[21] S
▽
```

D. SCALE

SCALE combines the previous functions to show the output.

```
∇ SCALE[□] ∇
∇ SCALE P
[1] M←M-1
[2] Z←NQUAN(,P)
[3] Z←(N,M)⍴Z
[4] CATEGORICAL Z
∇
```

E. RAW

RAW takes the scale values and boundaries from the previous functions and puts the values from the same z array on the same linear scale.

```
▽ RAW [□]
▽ RAW
[1] SLOPE←50÷((-1↑BOUNDS)-(1↑(-3↑BOUNDS)
[2] INT←100-SLOPE×(-1↑BOUNDS)
[3] TBOUNDS←INT+SLOPE×BOUNDS
[4] TS←INT+SLOPE×BOUNDS
[5] 'STANDARD DEVIATIONS ARE:'
[6] SD
[7] '  '
[8] 'BOUNDS'
[9] BOUNDS
[10] '  '
[11] 'TRANSPOSED BOUNDS'
[12] TBOUNDS
[13] '  '
[14] 'INSTANCE SCALE VALUES ARE:'
[15] S
[16] '  '
[17] 'TRANSPOSED S'
[18] TS
▽
```

## APPENDIX E. RESULTS

### A. SURVEY 1, TARGET ACQUISITION.

TABLE 1. QUESTION 1. ASSESS THE CHARACTERISTICS.

| CHARACTERISTIC | TRANSFORMED DATA | RANK |
|---|---|---|
| RANGE (0-60KM) | 82.50 | 5 |
| RANGE (60-100KM) | 73.81 | 7 |
| RANGE (100-160KM) | 73.28 | 8 |
| RANGE (160-490KM) | 65.57 | 11 |
| ACT TGT DETECTION | 63.38 | 12 |
| PAS TGT DETECTION | 86.63 | 2 |
| TGT ID | 68.74 | 4 |
| NON-COOP IFF | 74.54 | 6 |
| TGT LOC ERROR | 68.74 | 12 |
| TGT PROCESSING TIME | 83.65 | 3 |
| TGT DAMAGE ASSESSMENT | 69.55 | 9 |
| REAL TIME DATA FUSION | 92.17 | 1 |

TABLE 2. QUESTION 2. ASSESS THE CHARACTERISTICS.

| CHARACTERISTIC | TRANSFORMED DATA | RANK |
|---|---|---|
| LASER RANGEFINDER | 58.44 | 6 |
| THERMAL | 70.95 | 4 |
| VISUAL | 67.62 | 6 |
| MILLIMETER WAVE | 76.13 | 2 |
| ACOUSTIC | 73.23 | 3 |
| SIMULTANEOUS TGT | 90.81 | 1 |

TABLE 3. QUESTION 3. ASSESS THE SYSTEMS AGAINST RANGE, 0-60KM.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| ATACS | 77.52 | 2 |
| FORTAS | 73.77 | 3 |
| VIP | 64.32 | 8 |
| RECCE SHELL | 63.39 | 7 |
| TETHERED BALLOON | 49.03 | 10 |
| ASEMA | 64.23 | 9 |
| FUAV | 96.07 | 1 |
| GUARDRAIL | 70.91 | 4 |
| GROUND SENSOR | 67.92 | 5 |
| LBSR | 63.62 | 6 |

TABLE 4. QUESTION 4. ASSESS THE CHARACTERISTICS AGAINST RANGE, 60-100KM.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| ATACS | 66.48 | 4 |
| FORTAS | 52.36 | 6 |
| VIP | 45.31 | 9 |
| RECCE SHELL | 46.89 | 8 |
| TETHERED BALLOON | 38.82 | 10 |
| ASEMA | 74.66 | 2 |
| FUAV | 97.12 | 1 |
| GUARDRAIL | 73.75 | 3 |
| GROUND SENSOR | 61.54 | 5 |
| LBSR | 49.70 | 7 |

TABLE 5. QUESTION 5. ASSESS THE SYSTEMS AGAINST RANGE, 100-160KM.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| ATACS | 50.15 | 5 |
| FORTAS | 37.26 | 6 |
| VIP | 26.94 | 8 |
| RECCE SHELL | 25.33 | 10 |
| TETHERED BALLOON | 26.94 | 9 |
| ASEMA | 78.67 | 3 |
| FUAV | 96.12 | 1 |
| GUARDRAIL | 72.88 | 9 |
| GROUND SENSOR | 55.52 | 4 |
| LBSR | 36.02 | 7 |

TABLE 6. QUESTION 6. ASSESS THE SYSTEMS AGAINST RANGE 160-400KM.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| ATACS | 41.17 | 6 |
| FORTAS | 31.13 | 6 |
| VIP | 83.49 | 6 |
| RECCE SHELL | 16.78 | 8 |
| TETHERED BALLOON | 16.78 | 10 |
| ASEMA | 83.49 | 2 |
| FUAV | 95.27 | 1 |
| GUARDRAIL | 68.18 | 3 |
| GROUND SENSOR | 46.24 | 4 |
| LBSR | 28.20 | 7 |

TABLE 7. QUESTION 7. ASSESS THE SYSTEMS AGAINST ACTIVE TARGET DETECTION.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| ATACS | 75.00 | 2 |
| FORTAS | 65.49 | 4 |
| VIP | 55.13 | 9 |
| RECCE SHELL | 57.90 | 8 |
| TETHERED BALLOON | 44.69 | 10 |
| ASEMA | 71.10 | 4 |
| FUAV | 93.64 | 1 |
| GUARDRAIL | 74.53 | 3 |
| GROUND SENSOR | 67.68 | 5 |
| LBSR | 62.90 | 7 |

TABLE 8. QUESTION 8. ASSESS THE SYSTEMS AGAINST PASSIVE TARGET DETECTION.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| ATACS | 56.67 | 8 |
| FORTAS | 67.91 | 4 |
| VIP | 57.24 | 2 |
| RECCE SHELL | 63.08 | 5 |
| TETHERED BALLOON | 54.16 | 9 |
| ASEMA | 63.08 | 5 |
| FUAV | 84.21 | 1 |
| GUARDRAIL | 72.68 | 2 |
| GROUND SENSOR | 68.12 | 3 |
| LBSR | 43.94 | 10 |

TABLE 9. QUESTION 9. ASSESS THE SYSTEMS AGAINST TARGET IDENTIFICATION.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| ATACS | 66.67 | 5 |
| FORTAS | 73.65 | 3 |
| VIP | 64.75 | 4 |
| RECCE SHELL | 64.61 | 7 |
| TETHERED BALLOON | 51.30 | 10 |
| ASEMA | 72.26 | 4 |
| FUAV | 97.21 | 1 |
| GUARDRAIL | 74.14 | 2 |
| GROUND SENSOR | 61.92 | 8 |
| LBSR | 57.58 | 9 |

TABLE 10. QUESTION 10. ASSESS THE SYSTEMS AGAINST NON-COOPERATIVE IFF.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| ATACS | 56.99 | 7 |
| FORTAS | 66.35 | 4 |
| VIP | 54.80 | 9 |
| RECCE SHELL | 54.80 | 1 |
| TETHERED BALLOON | 46.66 | 10 |
| ASEMA | 72.47 | 2 |
| FUAV | 64.75 | 1 |
| GUARDRAIL | 71.40 | 3 |
| GROUND SENSOR | 64.93 | 5 |
| LBSR | 57.08 | 6 |

TABLE 11. QUESTION 11. ASSESS THE SYSTEMS AGAINST TARGET LOCATION ERROR.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| ATACS | 84.06 | 2 |
| FORTAS | 76.71 | 3 |
| VIP | 59.46 | 9 |
| RECCE SHELL | 62.88 | 6 |
| TETHERED BALLOON | 45.37 | 10 |
| ASEMA | 67.36 | 4 |
| FUAV | 85.00 | 1 |
| GUARDRAIL | 66.61 | 5 |
| GROUND SENSOR | 64.77 | 7 |
| LBSR | 62.14 | 8 |

TABLE 12. QUESTION 12. ASSESS THE SYSTEMS AGAINST TARGET PROCESSING TIME.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| ATACS | 75.00 | 2 |
| FORTAS | 75.00 | 3 |
| VIP | 57.21 | 5 |
| RECCE SHELL | 68.85 | 3 |
| TETHERED BALLOON | 42.43 | 10 |
| ASEMA | 68.85 | 5 |
| FUAV | 82.27 | 1 |
| GUARDRAIL | 69.57 | 1 |
| GROUND SENSOR | 67.42 | 6 |
| LBSR | 62.98 | 7 |

TABLE 13. QUESTION 13. ASSESS THE SYSTEMS AGAINST TARGET DAMAGE ASSESSMENT.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| ATACS | 48.33 | 10 |
| FORTAS | 66.89 | 5 |
| VIP | 66.89 | 3 |
| RECCE SHELL | 71.47 | 2 |
| TETHERED BALLOON | 47.98 | 80 |
| ASEMA | 70.80 | 3 |
| FUAV | 95.72 | 1 |
| GUARDRAIL | 55.83 | 5 |
| GROUND SENSOR | 50.73 | 7 |
| LBSR | 47.95 | 9 |

TABLE 14. QUESTION 14. ASSESS THE SYSTEMS AGAINST REAL TIME DATA FUSION.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| ATACS | 33.97 | 7 |
| FORTAS | 61.24 | 2 |
| VIP | 29.03 | 10 |
| RECCE SHELL | 45.10 | 8 |
| TETHERED BALLOON | 33.93 | 8 |
| ASEMA | 47.28 | 8 |
| FUAV | 71.23 | 1 |
| GUARDRAIL | 48.33 | 4 |
| GROUND SENSOR | 48.43 | 3 |
| LBSR | 31.18 | 9 |

TABLE 15. QUESTION 15. ASSESS THE SYSTEMS AGAINST LASER RANGE FINDER CAPABILITY.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| ATACS | 37.03 | 9 |
| FORTAS | 67.17 | 2 |
| VIP | 45.28 | 5 |
| RECCE SHELL | 48.91 | 3 |
| TETHERED BALLOON | 40.50 | 8 |
| ASEMA | 66.43 | 3 |
| FUAV | 89.35 | 1 |
| GUARDRAIL | 42.39 | 6 |
| GROUND SENSOR | 41.98 | 7 |
| LBSR | 36.47 | 10 |

TABLE 16. QUESTION 16. ASSESS THE SYSTEMS AGAINST THERMAL CAPABILITY.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| ATACS | 43.24 | 8 |
| FORTAS | 75.63 | 8 |
| VIP | 75.73 | 3 |
| RECCE SHELL | 72.00 | 4 |
| TETHERED BALLOON | 57.91 | 4 |
| ASEMA | 64.45 | 5 |
| FUAV | 97.33 | 4 |
| GUARDRAIL | 43.64 | 8 |
| GROUND SENSOR | 42.56 | 9 |
| LBSR | 39.63 | 10 |

TABLE 17. QUESTION 17. ASSESS THE SYSTEMS AGAINST VISUAL CAPABILITY.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| ATACS | 48.57 | 7 |
| FORTAS | 57.39 | 3 |
| VIP | 45.40 | 10 |
| RECCE SHELL | 45.40 | 8 |
| TETHERED BALLOON | 40.04 | 90 |
| ASEMA | 66.49 | 2 |
| FUAV | 79.77 | 1 |
| GUARDRAIL | 55.11 | 4 |
| GROUND SENSOR | 49.58 | 5 |
| LBSR | 49.15 | 6 |

TABLE 18. QUESTION 18. ASSESS THE SYSTEMS AGAINST MILLIMETER WAVE CAPABILITY.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| ATACS | 34.40 | 7 |
| FORTAS | 61.84 | 8 |
| VIP | 28.59 | 10 |
| RECCE SHELL | 34.40 | 9 |
| TETHERED BALLOON | 48.06 | 30 |
| ASEMA | 44.59 | 5 |
| FUAV | 57.12 | 2 |
| GUARDRAIL | 48.06 | 6 |
| GROUND SENSOR | 45.37 | 4 |
| LBSR | 36.95 | 8 |

TABLE 19. QUESTION 19. ASSESS THE SYSTEMS AGAINST ACOUSTIC CAPABILITY.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| ATACS | 78.10 | 2 |
| FORTAS | 66.65 | 6 |
| VIP | 47.92 | 9 |
| RECCE SHELL | 45.93 | 10 |
| TETHERED BALLOON | 48.64 | 9 |
| ASEMA | 78.10 | 2 |
| FUAV | 88.53 | 1 |
| GUARDRAIL | 72.64 | 3 |
| GROUND SENSOR | 71.33 | 5 |
| LBSR | 61.52 | 7 |

TABLE 20. QUESTION 20. ASSESS THE SYSTEMS AGAINST SIMULTANEOUS TARGET PROCESSING.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| ATACS | 74.12 | 6 |
| FORTAS | 76.18 | 3 |
| VIP | 53.86 | 5 |
| RECCE SHELL | 55.95 | 4 |
| TETHERED BALLOON | 42.89 | 10 |
| ASEMA | 74.91 | 4 |
| FUAV | 89.31 | 1 |
| GUARDRAIL | 74.86 | 5 |
| GROUND SENSOR | 76.46 | 2 |
| LBSR | 61.54 | 7 |

TABLE 21. QUESTION 21. ASSESS THE SYSTEMS

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| ATACS | 76.36 | 2 |
| FORTAS | 70.46 | 4 |
| VIP | 55.69 | 9 |
| RECCE SHELL | 59.65 | 7 |
| TETHERED BALLOON | 40.65 | 10 |
| ASEMA | 71.00 | 3 |
| FUAV | 104.21 | 1 |
| GUARDRAIL | 69.40 | 6 |
| GROUND SENSOR | 70.06 | 5 |
| LBSR | 56.83 | 8 |

SURVEY 2, WEAPONS SYSTEMS.
TABLE 1. QUESTION 1. ASSESS THE CHARACTERISTICS.

| CHARACTERISTIC | TRANSFORMED DATA | RANK |
|---|---|---|
| RATE OF FIRE | 69.47 | 13 |
| STR DEPLOYABILITY | 85.68 | 3 |
| OPN DEPLOYABILITY | 85.68 | 10 |
| TACTICAL MOBILITY | 84.53 | 4 |
| SUSTAINABILITY | 77.74 | 9 |
| ENVIRONMENT SURV | 66.15 | 14 |
| MAT HANDLING SURV | 67.93 | 14 |
| BAT DAMAGE SURV | 76.09 | 11 |
| ACCURACY | 88.65 | 1 |
| RANGE 0-60KM | 81.60 | 6 |
| RANGE 60-100KM | 81.60 | 9 |
| RANGE 100-160KM | 74.46 | 12 |
| RANGE 160-490KM | 66.97 | 10 |
| RELIABILITY | 85.74 | 2 |
| AVAILABILITY | 79.37 | 7 |
| MAINTAINABILITY | 78.74 | 8 |

TABLE 2. QUESTION 2. ASSESS THE SYSTEMS AGAINST RATE OF FIRE.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| AFAS | 79.49 | 1 |
| NLOS | 60.51 | 7 |
| MLRS | 77.14 | 2 |
| HIMARS | 74.42 | 3 |
| LT WEIGHT 155 | 66.33 | 4 |
| F2S2 | 56.68 | 8 |
| LONGFOG | 61.80 | 6 |
| EMG | 65.22 | 5 |

TABLE 3. QUESTION 3. ASSESS THE SYSTEMS AGAINST QUESTION STRATEGIC DEPLOYABILITY.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| AFAS | 61.94 | 7 |
| NLOS | 69.25 | 4 |
| MLRS | 69.45 | 3 |
| HIMARS | 88.32 | 1 |
| LT WEIGHT 155 | 85.34 | 2 |
| F2S2 | 63.10 | 6 |
| LONGFOG | 64.94 | 5 |
| EMG | 57.56 | 8 |

TABLE 4. QUESTION 4. ASSESS THE SYSTEMS AGAINST OPERATIONAL DEPLOYABILITY.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| AFAS | 74.84 | 3 |
| NLOS | 69.99 | 4 |
| MLRS | 64.83 | 7 |
| HIMARS | 81.65 | 2 |
| LT WEIGHT 155 | 82.87 | 4 |
| F2S2 | 67.44 | 5 |
| LONGFOG | 65.47 | 6 |
| EMG | 59.26 | 8 |

TABLE 5. QUESTION 5. ASSESS THE SYSTEMS AGAINST TACTICAL MOBILITY.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| AFAS | 79.94 | 1 |
| NLOS | 67.86 | 5 |
| MLRS | 73.82 | 3 |
| HIMARS | 75.72 | 2 |
| LT WEIGHT 155 | 71.65 | 4 |
| F2S2 | 63.66 | 7 |
| LONGFOG | 66.20 | 6 |
| EMG | 62.00 | 8 |

TABLE 6. QUESTION 6. ASSESS THE SYSTEMS AGAINST SUSTAINABILITY.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| AFAS | 76.49 | 2 |
| NLOS | 68.76 | 6 |
| MLRS | 76.56 | 4 |
| HIMARS | 71.31 | 3 |
| LT WEIGHT 155 | 68.76 | 5 |
| F2S2 | 66.39 | 7 |
| LONGFOG | 69.99 | 4 |
| EMG | 63.90 | 8 |

TABLE 7. QUESTION 7. ASSESS THE SYSTEMS AGAINST ENVIRONMENTAL SURVIVABILITY.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| AFAS | 80.57 | 3 |
| NLOS | 64.28 | 8 |
| MLRS | 74.96 | 2 |
| HIMARS | 71.74 | 4 |
| LT WEIGHT 155 | 67.50 | 4 |
| F2S2 | 64.62 | 7 |
| LONGFOG | 66.79 | 5 |
| EMG | 65.58 | 6 |

TABLE 8. QUESTION 8. ASSESS THE SYSTEMS AGAINST MATERIAL HANDLING SURVIVABILITY.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| AFAS | 88.73 | 1 |
| NLOS | 65.00 | 6 |
| MLRS | 75.24 | 3 |
| HIMARS | 67.49 | 4 |
| LT WEIGHT 155 | 61.73 | 8 |
| F2S2 | 69.86 | 3 |
| LONGFOG | 66.02 | 5 |
| EMG | 62.38 | 7 |

TABLE 9. QUESTION 9. ASSESS THE SYSTEMS AGAINST BATTLE DAMAGE SURVIVABILITY.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| AFAS | 89.27 | 1 |
| NLOS | 69.81 | 4 |
| MLRS | 76.60 | 3 |
| HIMARS | 83.31 | 2 |
| LT WEIGHT 155 | 76.22 | 4 |
| F2S2 | 72.05 | 5 |
| LONGFOG | 64.09 | 7 |
| EMG | 58.89 | 8 |

TABLE 10. QUESTION 10. ASSESS THE SYSTEMS AGAINST ACCURACY.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| AFAS | 80.03 | 2 |
| NLOS | 76.22 | 3 |
| MLRS | 69.05 | 6 |
| HIMARS | 68.77 | 7 |
| LT WEIGHT 155 | 71.33 | 5 |
| F2S2 | 74.29 | 4 |
| LONGFOG | 80.40 | 1 |
| EMG | 64.38 | 8 |

TABLE 11. QUESTION 11. ASSESS THE SYSTEMS AGAINST RANGE, 0-60KM.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| AFAS | 93.62 | 4 |
| NLOS | 73.24 | 4 |
| MLRS | 69.91 | 5 |
| HIMARS | 65.23 | 6 |
| LT WEIGHT 155 | 77.42 | 2 |
| F2S2 | 56.97 | 8 |
| LONGFOG | 61.63 | 7 |
| EMG | 75.54 | 3 |

TABLE 12. QUESTION 12. ASSESS THE SYSTEMS AGAINST RANGE, 60-100KM.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| AFAS | 54.52 | 5 |
| NLOS | 38.99 | 7 |
| MLRS | 76.80 | 7 |
| HIMARS | 80.10 | 1 |
| LT WEIGHT 155 | 39.21 | 7 |
| F2S2 | 70.61 | 4 |
| LONGFOG | 74.34 | 3 |
| EMG | 51.63 | 6 |

TABLE 13. QUESTION 13. ASSESS THE SYSTEMS AGAINST RANGE, 100-160KM.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| AFAS | 32.50 | 5 |
| NLOS | 29.45 | 7 |
| MLRS | 83.75 | 1 |
| HIMARS | 82.72 | 8 |
| LT WEIGHT 155 | 29.09 | 8 |
| F2S2 | 71.57 | 3 |
| LONGFOG | 66.66 | 4 |
| EMG | 31.55 | 6 |

TABLE 14. QUESTION 14. ASSESS THE SYSTEMS AGAINST RANGE, 160-400KM.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| AFAS | 22.27 | 5 |
| AFAS | 20.15 | 7 |
| MLRS | 94.78 | 1 |
| HIMARS | 93.24 | 8 |
| LT WEIGHT 155 | 19.43 | 8 |
| F2S2 | 85.33 | 3 |
| LONGFOG | 45.64 | 4 |
| EMG | 22.16 | 6 |

TABLE 15. QUESTION 15. ASSESS THE SYSTEMS AGAINST RELIABILITY.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| AFAS | 73.93 | 1 |
| NLOS | 72.97 | 5 |
| MLRS | 73.93 | 4 |
| HIMARS | 74.36 | 3 |
| LT WEIGHT 155 | 75.24 | 2 |
| F2S2 | 65.43 | 7 |
| LONGFOG | 67.06 | 6 |
| EMG | 60.76 | 8 |

TABLE 16. QUESTION 16. ASSESS THE SYSTEMS AGAINST AVAILABILITY.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| AFAS | 80.33 | 4 |
| NLOS | 69.72 | 5 |
| MLRS | 75.64 | 4 |
| HIMARS | 74.56 | 4 |
| LT WEIGHT 155 | 78.82 | 2 |
| F2S2 | 65.35 | 7 |
| LONGFOG | 67.77 | 6 |
| EMG | 60.31 | 8 |

TABLE 17. QUESTION 17. ASSESS THE SYSTEMS AGAINST MAINTAINABILITY.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| AFAS | 66.35 | 5 |
| NLOS | 66.04 | 6 |
| MLRS | 73.82 | 2 |
| HIMARS | 72.18 | 3 |
| LT WEIGHT 155 | 73.83 | 1 |
| F2S2 | 60.59 | 7 |
| LONGFOG | 66.64 | 4 |
| EMG | 57.89 | 8 |

TABLE 18. QUESTION 18. ASSESS THE SYSTEMS.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| AFAS | 84.12 | 2 |
| NLOS | 70.12 | 5 |
| MLRS | 79.78 | 3 |
| HIMARS | 84.54 | 1 |
| LT WEIGHT 155 | 71.20 | 4 |
| F2S2 | 61.09 | 8 |
| LONGFOG | 67.09 | 6 |
| EMG | 61.17 | 7 |

SURVEY 2, MUNITIONS.
TABLE 1. QUESTION 1. ASSESS THE CHARACTERISTICS.

| CHARACTERISTIC | TRANSFORMED DATA | RANK |
|---|---|---|
| EASE OF HANDLING | 78.83 | 6 |
| ACCURACY | 92.23 | 1 |
| RANGE, 0-60KM | 82.14 | 5 |
| RANGE, 60-100KM | 78.83 | 7 |
| RANGE, 100-160KM | 74.16 | 9 |
| RANGE, 160-490KM | 66.35 | 10 |
| LOITER ABILITY | 72.54 | 10 |
| COLLATERAL DAMAGE | 66.63 | 11 |
| FLEXIBILITY | 84.87 | 4 |
| LETHALITY ON SOFT TGTS | 79.41 | 6 |
| LETHALITY ON HARD TGTS | 85.56 | 3 |
| LETHALITY ON EMITTERS | 85.99 | 2 |

TABLE 2. QUESTION 2. ASSESS THE SYSTEMS AGAINST EASE OF HANDLING.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| SADARM P3I | 79.23 | 1 |
| MSN KILL MUNITION | 68.10 | 8 |
| DEEP ATTACK SMART | 78.41 | 2 |
| ENHANCED BLAST | 72.63 | 5 |
| HICAP | 65.97 | 10 |
| RFAM | 67.38 | 8 |
| SMART/BRILLIANT MINE | 74.46 | 4 |
| FUTURE SMART MUNITION | 75.80 | 3 |
| LONGARM | 63.33 | 11 |
| GLTR | 67.65 | 7 |
| LONGFOG | 62.41 | 12 |
| NLOS | 66.47 | 9 |

TABLE 3. QUESTION 3. ASSESS THE SYSTEMS AGAINST ACCURACY.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| SADARM P3I | 84.31 | 1 |
| MSN KILL MUNITION | 84.31 | 10 |
| DEEP ATTACK SMART | 80.72 | 3 |
| ENHANCED BLAST | 62.86 | 11 |
| HICAP | 62.86 | 10 |
| RFAM | 66.82 | 9 |
| SMART/BRILLIANT MINE | 73.08 | 5 |
| FUTURE SMART MUNITION | 83.62 | 2 |
| LONGARM | 71.19 | 7 |
| GLTR | 68.84 | 8 |
| LONGFOG | 71.55 | 6 |
| NLOS | 73.29 | 4 |

TABLE 4. QUESTION 4. ASSESS THE SYSTEMS AGAINST RANGE, 0-60KM.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| SADARM P3I | 82.72 | 1 |
| MSN KILL MUNITION | 68.37 | 6 |
| DEEP ATTACK SMART | 55.08 | 11 |
| ENHANCED BLAST | 69.29 | 5 |
| HICAP | 66.56 | 7 |
| RFAM | 65.96 | 8 |
| SMART/BRILLIANT MINE | 77.00 | 2 |
| FUTURE SMART MUNITION | 73.07 | 3 |
| LONGARM | 51.50 | 12 |
| GLTR | 59.91 | 9 |
| LONGFOG | 55.57 | 10 |
| NLOS | 72.10 | 4 |

TABLE 5. QUESTION 5. ASSESS THE SYSTEMS AGAINST RANGE, 60-100KM.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| SADARM P3I | 55.98 | 7 |
| MSN KILL MUNITION | 57.44 | 4 |
| DEEP ATTACK SMART | 50.53 | 8 |
| ENHANCED BLAST | 55.98 | 10 |
| HICAP | 41.91 | 11 |
| RFAM | 50.53 | 8 |
| SMART/BRILLIANT MINE | 56.62 | 5 |
| FUTURE SMART MUNITION | 67.45 | 1 |
| LONGARM | 58.15 | 3 |
| GLTR | 56.14 | 6 |
| LONGFOG | 60.68 | 2 |
| NLOS | 37.62 | 10 |

TABLE 6. QUESTION 6. ASSESS THE SYSTEMS AGAINST RANGE, 100-160KM.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| SADARM P3I | 51.58 | 7 |
| MSN KILL MUNITION | 49.88 | 8 |
| DEEP ATTACK SMART | 66.61 | 1 |
| ENHANCED BLAST | 44.04 | 9 |
| HICAP | 30.77 | 11 |
| RFAM | 53.11 | 6 |
| SMART/BRILLIANT MINE | 41.95 | 10 |
| FUTURE SMART MUNITION | 55.02 | 4 |
| LONGARM | 64.65 | 2 |
| GLTR | 62.50 | 3 |
| LONGFOG | 54.18 | 5 |
| NLOS | 29.77 | 12 |

TABLE 7. QUESTION 7. ASSESS THE SYSTEMS AGAINST RANGE, 160-400KM.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| SADARM P3I | 39.26 | 9 |
| MSN KILL MUNITION | 48.51 | 5 |
| DEEP ATTACK SMART | 69.18 | 1 |
| ENHANCED BLAST | 48.51 | 7 |
| HICAP | 24.90 | 11 |
| RFAM | 51.21 | 3 |
| SMART/BRILLIANT MINE | 34.72 | 10 |
| FUTURE SMART MUNITION | 45.27 | 6 |
| LONGARM | 68.25 | 2 |
| GLTR | 49.64 | 4 |
| LONGFOG | 42.40 | 8 |
| NLOS | 24.36 | 12 |

TABLE 8. QUESTION 8. ASSESS THE SYSTEMS AGAINST LOITER ABILITY.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| SADARM P3I | 50.21 | 5 |
| MSN KILL MUNITION | 42.59 | 9 |
| DEEP ATTACK SMART | 52.29 | 4 |
| ENHANCED BLAST | 30.20 | 11 |
| HICAP | 28.59 | 12 |
| RFAM | 39.31 | 10 |
| SMART/BRILLIANT MINE | 54.88 | 3 |
| FUTURE SMART MUNITION | 56.01 | 2 |
| LONGARM | 49.11 | 7 |
| GLTR | 67.09 | 1 |
| LONGFOG | 49.33 | 6 |
| NLOS | 44.42 | 8 |

TABLE 9. QUESTION 9. ASSESS THE SYSTEMS AGAINST MINIMIZING COLLATERAL DAMAGE.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| SADARM P3I | 66.18 | 3 |
| MSN KILL MUNITION | 59.07 | 7 |
| DEEP ATTACK SMART | 71.30 | 2 |
| ENHANCED BLAST | 58.31 | 8 |
| HICAP | 52.06 | 11 |
| RFAM | 47.53 | 12 |
| SMART/BRILLIANT MINE | 64.03 | 4 |
| FUTURE SMART MUNITION | 73.65 | 1 |
| LONGARM | 55.95 | 9 |
| GLTR | 58.31 | 10 |
| LONGFOG | 59.35 | 6 |
| NLOS | 60.99 | 5 |

TABLE 10. QUESTION 10. ASSESS THE SYSTEMS AGAINST FLEXIBILITY.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| SADARM P3I | 83.05 | 1 |
| MSN KILL MUNITION | 61.57 | 7 |
| DEEP ATTACK SMART | 69.11 | 4 |
| ENHANCED BLAST | 46.08 | 9 |
| HICAP | 42.10 | 12 |
| RFAM | 34.47 | 12 |
| SMART/BRILLIANT MINE | 71.57 | 3 |
| FUTURE SMART MUNITION | 77.30 | 2 |
| LONGARM | 62.61 | 9 |
| GLTR | 40.43 | 11 |
| LONGFOG | 57.60 | 8 |
| NLOS | 68.03 | 5 |

TABLE 11. QUESTION 11. ASSESS THE SYSTEMS AGAINST LETHALITY ON SOFT TARGETS.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| SADARM P3I | 67.22 | 2 |
| MSN KILL MUNITION | 66.79 | 3.5 |
| DEEP ATTACK SMART | 61.29 | 8 |
| ENHANCED BLAST | 72.23 | 1 |
| HICAP | 56.22 | 8 |
| RFAM | 42.58 | 11 |
| SMART/BRILLIANT MINE | 63.22 | 5 |
| FUTURE SMART MUNITION | 66.79 | 3.5 |
| LONGARM | 52.98 | 10 |
| GLTR | 42.33 | 12 |
| LONGFOG | 53.44 | 9 |
| NLOS | 58.37 | 7 |

TABLE 12. QUESTION 12. ASSESS THE SYSTEMS AGAINST LETHALITY ON HARD TARGETS.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| SADARM P3I | 37.42 | 11 |
| MSN KILL MUNITION | 41.25 | 10 |
| DEEP ATTACK SMART | 52.55 | 5 |
| ENHANCED BLAST | 57.00 | 3.5 |
| HICAP | 43.49 | 7 |
| RFAM | 78.99 | 1 |
| SMART/BRILLIANT MINE | 32.35 | 12 |
| FUTURE SMART MUNITION | 57.00 | 3.5 |
| LONGARM | 43.32 | 9 |
| GLTR | 78.34 | 2 |
| LONGFOG | 43.37 | 8 |
| NLOS | 44.21 | 6 |

TABLE 13. QUESTION 13. ASSESS THE SYSTEMS AGAINST LETHALITY ON EMITTERS.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| SADARM P3I | 58.95 | 4 |
| MSN KILL MUNITION | 43.67 | 10 |
| DEEP ATTACK SMART | 64.17 | 2 |
| ENHANCED BLAST | 29.57 | 12 |
| HICAP | 36.80 | 11 |
| RFAM | 53.24 | 7 |
| SMART/BRILLIANT MINE | 52.83 | 8 |
| FUTURE SMART MUNITION | 70.59 | 1 |
| LONGARM | 48.80 | 9 |
| GLTR | 55.08 | 6 |
| LONGFOG | 60.57 | 3 |
| NLOS | 57.96 | 5 |

TABLE 14. QUESTION 14. ASSESS THE SYSTEMS.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| SADARM P3I | 73.29 | 2 |
| MSN KILL MUNITION | 56.24 | 8 |
| DEEP ATTACK SMART | 67.11 | 4 |
| ENHANCED BLAST | 63.17 | 6 |
| HICAP | 52.67 | 12 |
| RFAM | 63.22 | 5 |
| SMART/BRILLIANT MINE | 68.21 | 3 |
| FUTURE SMART MUNITION | 75.00 | 1 |
| LONGARM | 54.14 | 91 |
| GLTR | 58.50 | 7 |
| LONGFOG | 53.72 | 10 |
| NLOS | 53.67 | 11 |

SURVEY 3, COMMAND AND CONTROL.
TABLE 1. QUESTION 1. ASSESS THE CHARACTERISTICS.

| CHARACTERISTIC | TRANSFORMED DATA | RANK |
|---|---|---|
| LONG COMMO RANGE | 80.26 | 12 |
| LARGE COMMO CAPACITY | 81.96 | 8 |
| SURV. FROM FA | 80.26 | 3 |
| SURV. FROM SMALL ARMS | 69.37 | 17 |
| SURV. FROM LARGE CALIBER | 59.49 | 18 |
| SURV. FROM DIRECTED ENERGY | 59.49 | 18 |
| RELIABILITY | 73.62 | 16 |
| AVAILABILITY | 87.36 | 2 |
| MAINTAINABILITY | 81.12 | 9 |
| STRATEGIC DEPLOYABILITY | 80.75 | 10 |
| OPERATIONAL DEPLOYABILITY | 80.41 | 11 |
| TACTICAL MOBILITY | 77.36 | 13 |
| SHORT EMPLACE TIME | 80.41 | 4 |
| REDUNDANCY | 82.11 | 6 |
| SUSCEPTIBILITY TO COUNTERMEASURES | 82.34 | 7 |
| FA MSN. AREA COMMONALITY | 82.34 | 5 |
| COMMONALITY WITH LT FORCE | 74.13 | 15 |
| COMMONALITY WITH HVY FORCE | 77.26 | 14 |
| CROSS MSN AREA COMMONALITY | 87.66 | 1 |

TABLE 2. QUESTION 2. ASSESS THE SYSTEMS AGAINST LONG COMMUNICATION RANGE.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| AFATDS | 69.70 | 3 |
| FFSCCS | 78.83 | 2 |
| LOW ECHELON KNOWLEDGE SYSTEM | 67.61 | 4 |
| WIDE AREA COMMO | 84.72 | 1 |
| FORCE LEVEL KNOWLEDGE SYSTEM | 61.50 | 6 |
| DISTRIBUTED IEW FUSION SYSTEM | 63.80 | 5 |

TABLE 3. QUESTION 3. ASSESS THE SYSTEMS AGAINST LARGE COMMUNICATIONS CAPACITY.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| AFATDS | 79.45 | 3 |
| FFSCCS | 79.45 | 2 |
| LOW ECHELON KNOWLEDGE SYSTEM | 63.45 | 6 |
| WIDE AREA COMMO | 81.02 | 1 |
| FORCE LEVEL KNOWLEDGE SYSTEM | 69.72 | 5 |
| DISTRIBUTED IEW FUSION SYSTEM | 73.49 | 4 |

TABLE 4. QUESTION 4. ASSESS THE SYSTEMS AGAINST EASE OF OPERATION.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| AFATDS | 84.76 | 1 |
| FFSCCS | 83.13 | 2 |
| LOW ECHELON KNOWLEDGE SYSTEM | 73.95 | 3 |
| WIDE AREA COMMO | 70.63 | 5 |
| FORCE LEVEL KNOWLEDGE SYSTEM | 68.94 | 6 |
| DISTRIBUTED IEW FUSION SYSTEM | 71.34 | 4 |

TABLE 5. QUESTION 5. ASSESS THE SYSTEMS AGAINST SURVIVABILITY FROM FIELD ARTILLERY.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| AFATDS | 79.71 | 1 |
| FFSCCS | 78.38 | 2 |
| LOW ECHELON KNOWLEDGE SYSTEM | 76.67 | 4 |
| WIDE AREA COMMO | 78.38 | 3 |
| FORCE LEVEL KNOWLEDGE SYSTEM | 73.53 | 6 |
| DISTRIBUTED IEW FUSION SYSTEM | 74.06 | 5 |

TABLE 6. QUESTION 6. ASSESS THE SYSTEMS AGAINST SURVIVABILITY FROM SMALL ARMS.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| AFATDS | 75.76 | 1 |
| FFSCCS | 73.48 | 2 |
| LOW ECHELON KNOWLEDGE SYSTEM | 71.26 | 3 |
| WIDE AREA COMMO | 65.14 | 4 |
| FORCE LEVEL KNOWLEDGE SYSTEM | 63.48 | 5 |
| DISTRIBUTED IEW FUSION SYSTEM | 63.30 | 6 |

TABLE 7. QUESTION 7. ASSESS THE SYSTEMS AGAINST SURVIVABILITY FROM LARGE CALIBER DIRECT FIRE.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| AFATDS | 73.98 | 1 |
| FFSCCS | 73.90 | 2 |
| LOW ECHELON KNOWLEDGE SYSTEM | 69.13 | 3 |
| WIDE AREA COMMO | 69.02 | 4 |
| FORCE LEVEL KNOWLEDGE SYSTEM | 66.67 | 6 |
| DISTRIBUTED IEW FUSION SYSTEM | 67.16 | 5 |

TABLE 8. QUESTION 8. ASSESS THE SYSTEMS AGAINST SURVIVABILITY FROM DIRECTED ENERGY.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| AFATDS | 76.45 | 2 |
| FFSCCS | 77.97 | 1 |
| LOW ECHELON KNOWLEDGE SYSTEM | 70.43 | 5 |
| WIDE AREA COMMO | 74.75 | 3 |
| FORCE LEVEL KNOWLEDGE SYSTEM | 69.52 | 6 |
| DISTRIBUTED IEW FUSION SYSTEM | 73.04 | 4 |

TABLE 9. QUESTION 9. ASSESS THE SYSTEMS AGAINST RELIABILITY.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| AFATDS | 79.50 | 1 |
| FFSCCS | 77.23 | 2 |
| LOW ECHELON KNOWLEDGE SYSTEM | 69.50 | 6 |
| WIDE AREA COMMO | 71.19 | 4 |
| FORCE LEVEL KNOWLEDGE SYSTEM | 70.53 | 5 |
| DISTRIBUTED IEW FUSION SYSTEM | 74.51 | 3 |

TABLE 10. QUESTION 10. ASSESS THE SYSTEMS AGAINST AVAILABILITY.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| AFATDS | 80.07 | 1 |
| FFSCCS | 78.38 | 2 |
| LOW ECHELON KNOWLEDGE SYSTEM | 70.26 | 5 |
| WIDE AREA COMMO | 73.92 | 3 |
| FORCE LEVEL KNOWLEDGE SYSTEM | 70.18 | 6 |
| DISTRIBUTED IEW FUSION SYSTEM | 71.68 | 4 |

TABLE 11. QUESTION 11. ASSESS THE SYSTEMS AGAINST MAINTAINABILITY.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| AFATDS | 79.28 | 1 |
| FFSCCS | 77.55 | 3 |
| LOW ECHELON KNOWLEDGE SYSTEM | 73.44 | 5 |
| WIDE AREA COMMO | 78.44 | 2 |
| FORCE LEVEL KNOWLEDGE SYSTEM | 71.40 | 6 |
| DISTRIBUTED IEW FUSION SYSTEM | 77.36 | 4 |

TABLE 12. QUESTION 12. ASSESS THE SYSTEMS AGAINST STRATEGIC DEPLOYABILITY.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| AFATDS | 85.70 | 2 |
| FFSCCS | 82.76 | 1 |
| LOW ECHELON KNOWLEDGE SYSTEM | 73.67 | 4 |
| WIDE AREA COMMO | 73.43 | 5 |
| FORCE LEVEL KNOWLEDGE SYSTEM | 68.42 | 6 |
| DISTRIBUTED IEW FUSION SYSTEM | 76.91 | 3 |

TABLE 13. QUESTION 13. ASSESS THE SYSTEMS AGAINST OPERATIONAL DEPLOYABILITY.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| AFATDS | 81.70 | 2 |
| FFSCCS | 81.99 | 1 |
| LOW ECHELON KNOWLEDGE SYSTEM | 74.30 | 4 |
| WIDE AREA COMMO | 72.46 | 5 |
| FORCE LEVEL KNOWLEDGE SYSTEM | 69.91 | 6 |
| DISTRIBUTED IEW FUSION SYSTEM | 75.79 | 3 |

TABLE 14. QUESTION 14. ASSESS THE SYSTEMS AGAINST TACTICAL MOBILITY.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| AFATDS | 81.31 | 1 |
| FFSCCS | 79.62 | 2 |
| LOW ECHELON KNOWLEDGE SYSTEM | 77.76 | 3 |
| WIDE AREA COMMO | 70.85 | 5 |
| FORCE LEVEL KNOWLEDGE SYSTEM | 68.49 | 6 |
| DISTRIBUTED IEW FUSION SYSTEM | 72.75 | 4 |

TABLE 15. QUESTION 15. ASSESS THE SYSTEMS AGAINST SHORT EMPLACE/DISPLACE TIME.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| AFATDS | 76.18 | 4 |
| FFSCCS | 77.13 | 3 |
| LOW ECHELON KNOWLEDGE SYSTEM | 72.47 | 5 |
| WIDE AREA COMMO | 78.94 | 1 |
| FORCE LEVEL KNOWLEDGE SYSTEM | 72.15 | 6 |
| DISTRIBUTED IEW FUSION SYSTEM | 78.67 | 2 |

TABLE 16. QUESTION 16. ASSESS THE SYSTEMS AGAINST REDUNDANCY.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| AFATDS | 76.92 | 2 |
| FFSCCS | 76.50 | 4 |
| LOW ECHELON KNOWLEDGE SYSTEM | 76.72 | 3 |
| WIDE AREA COMMO | 79.77 | 1 |
| FORCE LEVEL KNOWLEDGE SYSTEM | 70.33 | 6 |
| DISTRIBUTED IEW FUSION SYSTEM | 75.77 | 5 |

TABLE 17. QUESTION 17. ASSESS THE SYSTEMS AGAINST SUSCEPTIBILITY TO COUNTERMEASURES.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| AFATDS | 78.51 | 2 |
| FFSCCS | 80.70 | 1 |
| LOW ECHELON KNOWLEDGE SYSTEM | 75.48 | 3 |
| WIDE AREA COMMO | 76.92 | 5 |
| FORCE LEVEL KNOWLEDGE SYSTEM | 66.63 | 6 |
| DISTRIBUTED IEW FUSION SYSTEM | 78.26 | 3 |

TABLE 18. QUESTION 18. ASSESS THE SYSTEMS AGAINST FA MISSION AREA COMMONALITY WITHIN THE LIGHT FORCE.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| AFATDS | 86.18 | 1 |
| FFSCCS | 83.43 | 2 |
| LOW ECHELON KNOWLEDGE SYSTEM | 69.14 | 6 |
| WIDE AREA COMMO | 77.67 | 3 |
| FORCE LEVEL KNOWLEDGE SYSTEM | 71.03 | 5 |
| DISTRIBUTED IEW FUSION SYSTEM | 77.42 | 4 |

TABLE 19. QUESTION 19. ASSESS THE SYSTEMS AGAINST FA MISSION AREA COMMONALITY WITHIN THE HEAVY FORCE.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| AFATDS | 82.56 | 3 |
| FFSCCS | 82.56 | 1 |
| LOW ECHELON KNOWLEDGE SYSTEM | 73.38 | 5.5 |
| WIDE AREA COMMO | 80.43 | 2 |
| FORCE LEVEL KNOWLEDGE SYSTEM | 73.38 | 5.5 |
| DISTRIBUTED IEW FUSION SYSTEM | 77.38 | 4 |

TABLE 20. QUESTION 20. ASSESS THE SYSTEMS AGAINST CROSS MISSION AREA COMMONALITY.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| AFATDS | 75.06 | 5 |
| FFSCCS | 77.07 | 4 |
| LOW ECHELON KNOWLEDGE SYSTEM | 72.22 | 6 |
| WIDE AREA COMMO | 84.43 | 1 |
| FORCE LEVEL KNOWLEDGE SYSTEM | 79.68 | 2 |
| DISTRIBUTED IEW FUSION SYSTEM | 78.31 | 3 |

TABLE 21. QUESTION 21. ASSESS THE SYSTEMS.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| AFATDS | 76.61 | 4 |
| FFSCCS | 77.95 | 3 |
| LOW ECHELON KNOWLEDGE SYSTEM | 73.36 | 6 |
| WIDE AREA COMMO | 84.36 | 1 |
| FORCE LEVEL KNOWLEDGE SYSTEM | 73.39 | 5 |
| DISTRIBUTED IEW FUSION SYSTEM | 82.51 | 2 |

SURVEY 4, SUPT, SUSTAINMENT, AND STRAT DEPLOY AND TAC MOB.
TABLE 1. QUESTION 1. ASSESS THE CHARACTERISTICS.

| CHARACTERISTICS | TRANSFORMED DATA | RANK |
|---|---|---|
| MIN SHIP WT | 76.61 | 7 |
| MAX CONT | 78.71 | 6 |
| STRAT DEPLOY | 85.06 | 2 |
| OPN DEPLOY | 85.06 | 3 |
| TACT MOB | 86.67 | 1 |
| ENV SURV | 75.00 | 12 |
| MAT HANDLING SURV | 75.00 | 11 |
| BAT DAMAGE SURV | 69.05 | 15 |
| RELIABILITY | 83.19 | 4 |
| OPERATING RANGE | 72.50 | 10 |
| MSN AREA COM | 72.25 | 10 |
| MIN # OF PARTS | 70.01 | 13 |
| MAX COMMON PARTS | 73.95 | 9 |
| MIN UNIQUE TOOLS | 68.52 | 16 |
| MIN TOOLS | 66.49 | 17 |
| MAX MHE | 69.77 | 14 |
| MAX AUTOMATED MHE | 79.77 | 5 |

SURVEY 4, SUPT, SUSTAINMENT, AND STRAT DEPLOY AND TAC MOB.
TABLE 1. QUESTION 1. ASSESS THE CHARACTERISTICS.

| CHARACTERISTICS | TRANSFORMED DATA | RANK |
|---|---|---|
| MIN SHIP WT | 76.61 | 7 |
| MAX CONT | 78.71 | 4 |
| STRAT DEPLOY | 85.34 | 2 |
| OPN DEPLOY | 85.06 | 3 |
| TACT MOB | 86.67 | 1 |
| ENV SURV | 75.00 | 12 |
| MAT HANDLING SURV | 75.00 | 8 |
| BAT DAMAGE SURV | 69.05 | 10 |
| RELIABILITY | 83.19 | 4 |
| OPERATING RANGE | 72.50 | 10 |
| MSN AREA COM | 72.25 | 11 |
| MIN # OF PARTS | 72.50 | 13 |
| MAX COMMON PARTS | 73.95 | 9 |
| MIN UNIQUE TOOLS | 68.52 | 16 |
| MIN TOOLS | 66.49 | 17 |
| MAX MHE | 69.77 | 14 |
| MAX AUTOMATED MHE | 79.77 | 5 |

TABLE 5. QUESTION 5. ASSESS THE SYSTEMS AGAINST OPERATIONAL DEPLOYABILITY.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| FARV-A | 70.27 | 3 |
| REARMS | 68.01 | 4 |
| F2S2 (SUPT MODULE) | 68.01 | 5 |
| TRAC | 50.07 | 7 |
| ACA | 80.48 | 1 |
| LAMS | 78.01 | 2 |
| ROB LOG RES VEH | 65.06 | 6 |

TABLE 6. QUESTION 6. ASSESS THE SYSTEMS AGAINST TACTICAL MOBILITY.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| FARV-A | 75.80 | 2 |
| REARMS | 80.48 | 5 |
| F2S2 (SUPT MODULE) | 68.01 | 6 |
| TRAC | 53.01 | 7 |
| ACA | 76.70 | 1 |
| LAMS | 71.80 | 4 |
| ROB LOG RES VEH | 72.46 | 3 |

TABLE 7. QUESTION 7. ASSESS THE SYSTEMS AGAINST ENVIRONMENTAL SURVIVABILITY.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| FARV-A | 70.27 | 1 |
| REARMS | 74.80 | 2 |
| F2S2 (SUPT MODULE) | 70.92 | 3 |
| TRAC | 54.28 | 7 |
| ACA | 65.63 | 5 |
| LAMS | 63.04 | 6 |
| ROB LOG RES VEH | 69.71 | 4 |

TABLE 8. QUESTION 8. ASSESS THE SYSTEMS AGAINST MATERIAL HANDLING SURVIVABILITY.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| FARV-A | 75.14 | 2 |
| REARMS | 76.11 | 1 |
| F2S2 (SUPT MODULE) | 70.22 | 5 |
| TRAC | 48.84 | 7 |
| ACA | 71.68 | 4 |
| LAMS | 68.34 | 6 |
| ROB LOG RES VEH | 74.47 | 3 |

TABLE 9. QUESTION 9. ASSESS THE SYSTEMS AGAINST BATTLE DAMAGE SURVIVABILITY.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| FARV-A | 80.32 | 1 |
| REARMS | 74.45 | 3 |
| F2S2 (SUPT MODULE) | 68.65 | 4 |
| TRAC | 55.54 | 7 |
| ACA | 66.78 | 5 |
| LAMS | 63.77 | 6 |
| ROB LOG RES VEH | 74.66 | 2 |

TABLE 10. QUESTION 10. ASSESS THE SYSTEMS AGAINST RELIABILITY.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| FARV-A | 71.25 | 1 |
| REARMS | 67.57 | 2 |
| F2S2 (SUPT MODULE) | 66.05 | 5 |
| TRAC | 54.92 | 7 |
| ACA | 67.57 | 4 |
| LAMS | 63.45 | 6 |
| ROB LOG RES VEH | 67.60 | 3 |

TABLE 11. QUESTION 11. ASSESS THE SYSTEMS AGAINST BATTLEFIELD OPERATING RANGE.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| FARV-A | 69.28 | 4 |
| REARMS | 69.34 | 4 |
| F2S2 (SUPT MODULE) | 68.68 | 5 |
| TRAC | 48.26 | 7 |
| ACA | 81.52 | 1 |
| LAMS | 76.13 | 2 |
| ROB LOG RES VEH | 68.42 | 6 |

TABLE 12. QUESTION 12. ASSESS THE SYSTEMS AGAINST MISSION AREA COMMONALITY.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| FARV-A | 72.95 | 1 |
| REARMS | 71.34 | 2 |
| F2S2 (SUPT MODULE) | 66.09 | 4 |
| TRAC | 45.40 | 7 |
| ACA | 64.00 | 5 |
| LAMS | 60.97 | 6 |
| ROB LOG RES VEH | 67.26 | 3 |

TABLE 13. QUESTION 13. ASSESS THE SYSTEMS AGAINST MINIMAL NUMBER OF PARTS.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| FARV-A | 66.19 | 2 |
| REARMS | 67.41 | 1 |
| F2S2 (SUPT MODULE) | 64.01 | 3 |
| TRAC | 51.63 | 7 |
| ACA | 51.63 | 5 |
| LAMS | 58.80 | 6 |
| ROB LOG RES VEH | 62.21 | 4 |

TABLE 14. QUESTION 14. ASSESS THE SYSTEMS AGAINST MAXIMIZING COMMON PARTS.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| FARV-A | 71.13 | 2 |
| REARMS | 75.01 | 1 |
| F2S2 (SUPT MODULE) | 66.63 | 3 |
| TRAC | 50.00 | 7 |
| ACA | 60.24 | 5 |
| LAMS | 57.70 | 6 |
| ROB LOG RES VEH | 64.37 | 4 |

TABLE 15. QUESTION 15. ASSESS THE SYSTEMS AGAINST MINIMIZING UNIQUE TOOLS.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| FARV-A | 65.47 | 2 |
| REARMS | 66.70 | 1 |
| F2S2 (SUPT MODULE) | 62.93 | 3 |
| TRAC | 41.73 | 7 |
| ACA | 58.55 | 5 |
| LAMS | 55.79 | 6 |
| ROB LOG RES VEH | 62.13 | 4 |

TABLE 16. QUESTION 16. ASSESS THE SYSTEMS AGAINST MINIMIZING TOOLS.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| FARV-A | 65.06 | 2 |
| REARMS | 66.19 | 1 |
| F2S2 (SUPT MODULE) | 61.08 | 3 |
| TRAC | 45.68 | 7 |
| ACA | 65.06 | 5 |
| LAMS | 55.49 | 6 |
| ROB LOG RES VEH | 58.26 | 4 |

TABLE 17. QUESTION 17. ASSESS THE SYSTEMS AGAINST MAXIMIZING MATERIAL HANDLING EQUIPMENT.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| FARV-A | 74.12 | 2 |
| REARMS | 75.14 | 4 |
| F2S2 (SUPT MODULE) | 70.75 | 5 |
| TRAC | 42.52 | 7 |
| ACA | 71.62 | 4 |
| LAMS | 64.86 | 6 |
| ROB LOG RES VEH | 73.43 | 3 |

TABLE 18. QUESTION 18. ASSESS THE SYSTEMS AGAINST MAXIMIZING AUTOMATED MATERIAL HANDLING DEVICES.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| FARV-A | 74.41 | 2 |
| REARMS | 79.47 | 3 |
| F2S2 (SUPT MODULE) | 43.93 | 6 |
| TRAC | 43.93 | 7 |
| ACA | 68.57 | 5 |
| LAMS | 70.59 | 4 |
| ROB LOG RES VEH | 82.89 | 1 |

TABLE 19. QUESTION 19. ASSESS THE SYSTEMS.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| FARV-A | 79.47 | 7 |
| REARMS | 66.72 | 4 |
| F2S2 (SUPT MODULE) | 64.61 | 6 |
| TRAC | 48.31 | 7 |
| ACA | 79.47 | 1 |
| LAMS | 69.06 | 3 |
| ROB LOG RES VEH | 65.62 | 5 |

SURVEY 5.

TABLE 1. QUESTION 1. ASSESS THE COMPONENTS OF COMBAT POWER.

| COMPONENTS | TRANSFORMED DATA | RANK |
|---|---|---|
| FIREPOWER | 89.08 | 1 |
| MANEUVER | 82.89 | 2 |
| PROTECTION | 71.59 | 3 |

TABLE 2. QUESTION 2. ASSESS THE CAPABILITIES OF FIREPOWER.

| CAPABILITIES | TRANSFORMED DATA | RANK |
|---|---|---|
| ACT TGT DETECTION | 68.86 | |
| PAS TGT DETECTION | 89.19 | 8 |
| TGT IDENTIFICATION | 78.47 | 8 |
| NON-COOPERATIVE IFF | 89.08 | 6 |
| TGT ACQUISITION | 89.08 | 7 |
| TGT ENGAGEMENT | 78.95 | 2 |
| ACCURACY | 79.85 | 5 |
| LETHALITY | 79.01 | 3 |

TABLE 3. QUESTION 3. ASSESS THE COMPONENTS OF MANEUVER.

| COMPONENTS | TRANSFORMED DATA | RANK |
|---|---|---|
| GREATER ACL | 62.67 | 9 |
| GREATER AGILITY | 68.86 | 3 |
| LESS WEIGHT | 89.08 | 2 |
| OBSTACLE CROSSING | 69.91 | 5 |
| TACTICAL SPEED | 76.83 | 5 |
| OPERATIONAL SPEED | 76.83 | 7 |
| STRATEGIC SPEED | 77.62 | 5 |
| OPERATING RANGE | 89.19 | 3 |
| MAINTAINABILITY | 86.01 | 1 |

TABLE 4. QUESTION 4. ASSESS THE COMPONENTS OF PROTECTION.

| COMPONENTS | TRANSFORMED DATA | RANK |
|---|---|---|
| SIZE | 69.02 | 10 |
| ARMOR QUALITY | 76.85 | 8 |
| SIGNATURE | 85.64 | 1 |
| DEFILADE FIRING | 65.94 | 12 |
| OVER HORIZON FIRING | 78.56 | 4 |
| EM/VISUAL CAMO | 78.71 | 3 |
| EW SENSORS | 82.01 | 8 |
| DECOYS | 72.47 | 8 |
| LOW OBSERVABLES | 78.56 | 8 |
| EMPLACE TIME | 74.66 | 7 |
| NBC DETECTION | 67.74 | 11 |
| NBC PROTECTION | 70.97 | 9 |

TABLE 5. QUESTION 5. ASSESS THE COMPONENTS OF FORCE PROJECTION.

| COMPONENTS | TRANSFORMED DATA | RANK |
|---|---|---|
| STRATEGIC DEPLOY | 91.71 | 4 |
| OPERATIONAL DEPLOY | 69.42 | 3 |
| TACTICAL MOB | 73.71 | 2 |

TABLE 6. QUESTION 6. ASSESS THE COMPONENTS OF UNIT SUPPORT.

| COMPONENT | TRANSFORMED DATA | RANK |
|---|---|---|
| MAINTAINABILITY | 85.17 | 2 |
| SUPPLY DISTRIBUTION | 81.92 | 3 |
| RELIABILITY | 91.89 | 1 |
| TAC SUP TRANSPORT | 77.91 | 5 |
| TAC POL TRANSPORT | 78.66 | 4 |

TABLE 7. QUESTION 7. ASSESS THE COMPONENTS OF SUSTAINMENT.

| COMPONENT | TRANSFORMED DATA | RANK |
|---|---|---|
| MEDICAL EVACUATION | 71.13 | 5 |
| UNIT RECONSTRUCTION | 74.31 | 4 |
| MEDICAL CAPACITY | 69.43 | 6 |
| LOGISTICAL MOBILITY | 86.69 | 1 |
| INDUSTRIAL BASE | 74.61 | 3 |
| SOLDIER TRNG BASE | 79.55 | 2 |
| MANPOWER MANAGEMENT | 66.43 | 7 |

TABLE 8. QUESTION 8. ASSESS THE SYSTEMS OF FIRE SUPPORT.

| SYSTEMS | TRANSFORMED DATA | RANK |
|---|---|---|
| MORTARS | 56.01 | 8 |
| FA CANNON FIRE | 75.30 | 8 |
| GRD LAUN MSL (LOS) | 49.60 | 9 |
| GRD LAUN MSL (NLOS) | 69.43 | 1 |
| NAVAL CANNON FIRE | 49.60 | 10 |
| NAVAL MSL (LOS) | 52.86 | 9 |
| NAVAL MSL (NLOS) | 75.25 | 4 |
| AIR CANNON FIRE | 57.94 | 7 |
| AIR LAUN MSL (LOS) | 71.08 | 5 |
| AIR LAUN MSL (NLOS) | 84.31 | 2 |

TABLE 9. QUESTION 9. ASSESS THE CAPABILITIES OF THE FIELD ARTILLERY BATTLEFIELD FUNCTIONAL MISSION AREA.

| CAPABILITIES | TRANSFORMED DATA | RANK |
|---|---|---|
| COUNTERFIRE | 76.69 | 5 |
| ATTK OF UNCOM FORCE | 83.89 | 1 |
| SUPPRESSION OF ADA | 82.33 | 3 |
| ATTK OF EMITTERS | 80.18 | 4 |
| NBC DETERRENCE | 65.55 | 8 |
| ATTK CLOSE IN FORCE | 82.74 | 2 |
| MSL DEFENSE | 76.34 | 6 |
| COUNTERMOBILITY | 69.88 | 7 |

SURVEY 6.
TABLE 1. QUESTION 1. ASSESS THE PROBABILITY THAT THESE TECHNOLOGIES WILL HAVE A BIG IMPACT BY THE YEAR 2015.

| TECHNOLOGIES | TRANSFORMED DATA | RANK |
|---|---|---|
| ADV MATERIALS | 81.09 | 6 |
| ADV PROPULSION | 58.38 | 13 |
| ADV SIGNAL PROC | 90.99 | 1 |
| AI | 83.43 | 3 |
| BIOTECHNOLOGY | 98.99 | 12 |
| DIRECTED ENERGY | 68.02 | 11 |
| LOW OBSERVABLES | 72.44 | 10 |
| MICRO-ELECTRONICS/ PHOTONICS/ACOUSTICS | 82.34 | 5 |
| NEUROSCIENCE | 58.38 | 10 |
| POWER GENERATION/ STORAGE/CONDITIONING | 79.48 | 7 |
| PROT/LETHALITY | 85.94 | 4 |
| ROBOTICS | 77.59 | 8 |
| SPACE TECHNOLOGY | 73.39 | 9 |

TABLE 2. QUESTION 2. ASSESS THE PROBABILITY THAT THESE TECHNOLOGIES WILL BE SUCCESSFULLY INCORPORATED INTO FIRE SUPPORT SYSTEMS BY THE YEAR 2015.

| TECHNOLOGIES | TRANSFORMED DATA | RANK |
|---|---|---|
| ADV MATERIALS | 81.95 | 5 |
| ADV PROPULSION | 90.59 | 3 |
| ADV SIGNAL PROC | 94.46 | 1 |
| AI | 82.94 | 4 |
| BIOTECHNOLOGY | 55.55 | 13 |
| DIRECTED ENERGY | 62.29 | 11 |
| LOW OBSERVABLES | 73.21 | 90 |
| MICRO-ELECTRONICS/ PHOTONICS/ACOUSTICS | 80.46 | 6 |
| NEUROSCIENCE | 58.17 | 12 |
| POWER GENERATION/ STORAGE/CONDITIONING | 79.34 | 7 |
| PROT/LETHALITY | 90.59 | 2 |
| ROBOTICS | 73.71 | 8 |
| SPACE TECHNOLOGY | 72.32 | 10 |

TABLE 3. QUESTION 3. ASSESS WITH WHAT PROBABILITY THE ARMY SHOULD INVEST IN THESE TECHNOLOGIES.

| TECHNOLOGIES | TRANSFORMED DATA | RANK |
|---|---|---|
| ADV MATERIALS | 76.35 | 7 |
| ADV PROPULSION | 80.61 | 5 |
| ADV SIGNAL PROC | 89.07 | 1 |
| AI | 75.57 | 5 |
| BIOTECHNOLOGY | 53.54 | 12 |
| DIRECTED ENERGY | 61.91 | 11 |
| LOW OBSERVABLES | 73.12 | 5 |
| MICRO-ELECTRONICS/ PHOTONICS/ACOUSTICS | 86.25 | 3 |
| NEUROSCIENCE | 53.25 | 13 |
| POWER GENERATION/ STORAGE/CONDITIONING | 79.75 | 6 |
| PROT/LETHALITY | 89.07 | 2 |
| ROBOTICS | 82.21 | 4 |
| SPACE TECHNOLOGY | 67.39 | 10 |

TABLE 4. QUESTION 4. ASSESS THE IMPACT THAT THESE SYSTEMS WILL HAVE BY THE YEAR 2015.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| ADV SOLDIER SUIT | 64.23 | 8 |
| PRE LONG RANGE WPNS | 98.61 | 1 |
| M-SPEC SENSOR | 96.26 | 2 |
| DEPLOY & LOG SYS | 91.13 | 3 |
| NONLETHAL WPNS | 61.26 | 9 |
| ELEC GRD MOB SYS | 60.58 | 10 |
| ROBOTICS | 70.85 | 7 |
| ADV BAT MANAGEMENT | 84.36 | 4 |
| DECOYS & DECEPTION | 71.13 | 6 |
| AIR MOB SYSTEMS | 71.42 | 5 |

TABLE 5. QUESTION 5. ASSESS THE PROBABILITY THAT THESE SYSTEMS WILL BE INCORPORATED INTO THE FIELD ARTILLERY BY THE YEAR 2015.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| ADV SOLDIER SUIT | 64.05 | 8 |
| PRE LONG RANGE WPNS | 99.46 | 1 |
| M-SPEC SENSOR | 91.18 | 2 |
| DEPLOY & LOG SYS | 80.58 | 3 |
| NONLETHAL WPNS | 61.23 | 9 |
| ELEC GRD MOB SYS | 59.57 | 10 |
| ROBOTICS | 74.26 | 6 |
| ADV BAT MANAGEMENT | 84.34 | 4 |
| DECOYS & DECEPTION | 73.51 | 7 |
| AIR MOB SYSTEMS | 74.54 | 5 |

TABLE 6. QUESTION 6. ASSESS WITH WHAT PROBABILITY THE ARMY SHOULD INVEST IN THE FOLLOWING SYSTEMS.

| SYSTEM | TRANSFORMED DATA | RANK |
|---|---|---|
| ADV SOLDIER SUIT | 67.52 | 8 |
| PRE LONG RANGE WPNS | 98.94 | 1 |
| M-SPEC SENSOR | 92.12 | 2 |
| DEPLOY & LOG SYS | 79.47 | 4 |
| NONLETHAL WPNS | 59.50 | 10 |
| ELEC GRD MOB SYS | 60.76 | 9 |
| ROBOTICS | 69.95 | 7 |
| ADV BAT MANAGEMENT | 84.47 | 3 |
| DECOYS & DECEPTION | 76.98 | 5 |
| AIR MOB SYSTEMS | 71.65 | 6 |

# APPENDIX F. SURVEYS

The surveys on the following pages are provided in their original form. This form includes the original page numbering as the reader will better understand the organization of each survey with the orignal numbers on them.

TECHNOLOGY BASE/FIELD ARTILLERY
SEMINAR WARGAME

DATA COLLECTION

We hope your experiences during this technology wargame will provide useful insight towards defining and clarifying issues about the uses of new technologies and the future of warfighting. To assist decisionmakers in understanding your insights, a questionnaire survey will be given at the conclusion of each phase of the wargame.

**Privacy Act Information**

The data collected with these questionnaires will be used for research purposes only. The questionnaires were developed by TRADOC Analysis Command-Monterey for the Army Material Command Technology Planning and Management branch. Names are to be used for administrative and statistical control purposes only. Full confidentiality of your responses will be maintained in the processing of these data. Disclosure of information is voluntary. Not providing information, however, will mean your views will not be included in the analysis of survey results.

**Administrative Information** (Please Print)

NAME _____

IN WHAT SCENARIO DID YOU PARTICIPATE? (Circle One)

Dessert

Northern Continental

Tropical

IN WHAT VIGNETTE DID YOU PARTICIPATE? (Circle One)

Long-range Fires

Close Fires

IF YOU ARE RETIRED MILITARY, WHAT IS YOUR:

Branch of Service _____ Specialty _____

## SURVEY I

## INSTRUCTIONS

The following survey will give Army decision makers insight on your view of how technology may provide improved warfighting capability to a future force in the year 2015. The questions are general in nature, relating to characteristics and systems applicable to **Fire Support Target Acquisition.** For your responses, consider your **general impression** gained through a look at the scenarios you examined. As always, **your first impression is usually best.** Your answers to these questions will be analyzed to help determine the direction of United States Army technology investments.

INSTRUCTIONS: PLACE AN "X" IN THE COLUMN THAT *MOST CLOSELY* CORRESPONDS TO YOUR OPINION.

THE TERM "FIXED BUDGET" IN THE QUESTIONS BELOW IS A CONSTRAINT THAT ALLOWS YOU TO FUND SOME OF THE CHARACTERISTICS OR SYSTEMS YOU DESIRE, BUT NOT ALL.

THE ROW LABELED "VERBAL EXPRESSION OF PROBABILITY" IS A VERBAL DESCRIPTION OF THE PROBABILITY. THE ROW LABELED "NUMERICAL RANGE OF PROBABILITY" IS A NUMERICAL DESCRIPTION OF THE RANGE OF THE PROBABILITY. BOTH ARE PROVIDED TO ASSIST YOU IN YOUR ASSESSMENT.

EXAMPLE: The following is an example question with responses marked in the correct manner.

Given a fixed budget and assuming that maximizing accuracy will win the war, indicate with what probability you would allocate funds to the following system.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| Musket | (X) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| M16 Rifle | ( ) | ( ) | ( ) | ( ) | (X) | ( ) | ( ) |
| M14 Rifle | ( ) | ( ) | ( ) | ( ) | ( ) | (X) | ( ) |
| 9MM Pistol | ( ) | (X) | ( ) | ( ) | ( ) | ( ) | ( ) |

PLEASE ANSWER THE QUESTIONS STARTING ON THE NEXT PAGE

**The following questions focus on Target Acquisition Assets that are being considered for Fire Support.**

The following abbreviations are used throughout the survey.

IFF = Identification Friend or Foe
ATACS = Advanced Target Acquisition Counterfire System
FORTAS = Forward Observation Remote Target Acquisition System
VIP = Video Imaging Projectile
RECCE = Reconnaissance
ASEMA = Advanced Special Electronic Mission Aircraft
FUAV =Future Unmanned Aerial Vehicle
LBSR = Lightweight Battlefield Surveillance Radar

1. Given a fixed budget from which you are to develop some but not all the following capabilities for Fire Support Target Acquisition assets to be fielded in the year 2015, indicate with what probability you would allocate funds to develop the following capabilities.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| Range (0-60 KM) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| (60-100 KM) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| (100-160 KM) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| (160-490 KM) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Active Target Detection | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Passive Target Detection | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Target Identification | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Non-cooperative IFF | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Target Location Error | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Target Processing Time | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Target Damage Assessment | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Real Time Data Fusion | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

2. Given a fixed budget from which you are to develop some but not all the following capabilities for Fire Support Target Acquisition assets to be fielded in the year 2015, indicate with what probability you would allocate funds to develop the following capabilities.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| Laser Rangefinder Capability | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Thermal (IR) Capability | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Visual Capability | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Millimeter Wave Capability | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Acoustic Capability | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Simultaneous Target Processing | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

3. Given a fixed budget and assuming that maximizing capabilities in the 0 to 60 KM range will win the war, indicate with what probability you would allocate funds to develop the following system.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| ATACS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FORTAS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| VIP | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| RECCE Shell | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Tethered Balloon | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ASEMA | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FUAV | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Guardrail common sensor | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Ground based common sensor | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LBSR | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

4. Given a fixed budget and assuming that maximizing capabilities in the 60 to 100 KM range will win the war, indicate with what probability you would allocate funds to develop the following system.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| ATACS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FORTAS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| VIP | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| RECCE Shell | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Tethered Balloon | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ASEMA | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FUAV | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Guardrail common sensor | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Ground based common sensor | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LBSR | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

5. Given a fixed budget and assuming that maximizing capabilities in the 100 to 160 KM range will win the war, indicate with what probability you would allocate funds to develop the following system.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| ATACS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FORTAS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| VIP | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| RECCE Shell | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Tethered Balloon | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ASEMA | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FUAV | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Guardrail common sensor | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Ground based common sensor | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LBSR | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

6. Given a fixed budget and assuming that maximizing capabilities in the 160 to 490 KM range will win the war, indicate with what probability you would allocate funds to develop the following system.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| ATACS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FORTAS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| VIP | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| RECCE Shell | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Tethered Balloon | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ASEMA | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FUAV | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Guardrail common sensor | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Ground based common sensor | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LBSR | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

7. Given a fixed budget and assuming that maximizing the capability to actively detect targets will win the war, indicate with what probability you would allocate funds to develop the following system.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| ATACS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FORTAS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| VIP | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| RECCE Shell | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Tethered Balloon | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ASEMA | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FUAV | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Guardrail common sensor | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Ground based common sensor | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LBSR | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

8. Given a fixed budget and assuming that maximizing the capability to passively detect targets will win the war, indicate with what probability you would allocate funds to develop the following system.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| ATACS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FORTAS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| VIP | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| RECCE Shell | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Tethered Balloon | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ASEMA | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FUAV | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Guardrail common sensor | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Ground based common sensor | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LBSR | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

9. Given a fixed budget and assuming that optimizing the target identification capability will win the war, indicate with what probability you would allocate funds to develop the following system.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| ATACS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FORTAS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| VIP | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| RECCE Shell | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Tethered Balloon | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ASEMA | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FUAV | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Guardrail common sensor | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Ground based common sensor | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LBSR | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

10. Given a fixed budget and assuming that optimizing the non-cooperative IFF capability will win the war, indicate with what probability you would allocate funds to develop the following system.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| ATACS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FORTAS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| VIP | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| RECCE Shell | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Tethered Balloon | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ASEMA | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FUAV | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Guardrail common sensor | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Ground based common sensor | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LBSR | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

11. Given a fixed budget and assuming that minimizing target location error will win the war, indicate with what probability you would allocate funds to develop the following system.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| ATACS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FORTAS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| VIP | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| RECCE Shell | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Tethered Balloon | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ASEMA | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FUAV | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Guardrail common sensor | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Ground based common sensor | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LBSR | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

12. Given a fixed budget and assuming that minimizing target processing time will win the war, indicate with what probability you would allocate funds to develop the following system.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| ATACS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FORTAS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| VIP | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| RECCE Shell | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Tethered Balloon | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ASEMA | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FUAV | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Guardrail common sensor | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Ground based common sensor | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LBSR | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

13. Given a fixed budget and assuming that optimizing the capability to conduct target damage assessment will win the war, indicate with what probability you would allocate funds to develop the following system.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| ATACS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FORTAS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| VIP | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| RECCE Shell | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Tethered Balloon | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ASEMA | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FUAV | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Guardrail common sensor | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Ground based common sensor | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LBSR | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

14. Given a fixed budget and assuming that maximizing the laser range finding capability will win the war, indicate with what probability you would allocate funds to develop the following system.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| ATACS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FORTAS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| VIP | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| RECCE Shell | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Tethered Balloon | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ASEMA | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FUAV | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Guardrail common sensor | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Ground based common sensor | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LBSR | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

15. Given a fixed budget and assuming that maximizing the Infra Red capability will win the war, indicate with what probability you would allocate funds to develop the following system.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| ATACS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FORTAS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| VIP | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| RECCE Shell | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Tethered Balloon | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ASEMA | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FUAV | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Guardrail common sensor | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Ground based common sensor | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LBSR | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

16. Given a fixed budget and assuming that maximizing the visual capability will win the war, indicate with what probability you would allocate funds to develop the following system.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| ATACS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FORTAS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| VIP | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| RECCE Shell | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Tethered Balloon | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ASEMA | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FUAV | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Guardrail common sensor | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Ground based common sensor | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LBSR | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

17. Given a fixed budget and assuming that maximizing the millimeter wave capability will win the war, indicate with what probability you would allocate funds to develop the following system.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| ATACS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FORTAS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| VIP | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| RECCE Shell | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Tethered Balloon | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ASEMA | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FUAV | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Guardrail common sensor | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Ground based common sensor | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LBSR | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

18. Given a fixed budget and assuming that maximizing the acoustic capability will win the war, indicate with what probability you would allocate funds to develop the following system.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| ATACS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FORTAS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| VIP | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| RECCE Shell | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Tethered Balloon | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ASEMA | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FUAV | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Guardrail common sensor | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Ground based common sensor | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LBSR | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

19. Given a fixed budget and assuming that maximizing the simultaneous target processing capability will win the war, indicate with what probability you would allocate funds to develop the following system.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| ATACS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FORTAS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| VIP | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| RECCE Shell | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Tethered Balloon | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ASEMA | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FUAV | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Guardrail common sensor | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Ground based common sensor | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LBSR | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

20. Given a fixed budget and assuming that minimizing the real time data fusion capability will win the war, indicate with what probability you would allocate funds to develop the following system.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| ATACS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FORTAS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| VIP | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| RECCE Shell | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Tethered Balloon | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ASEMA | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FUAV | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Guardrail common sensor | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Ground based common sensor | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LBSR | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

21. Given a fixed budget and the knowledge you just gained from playing the last vignette, indicate with what probability you would allocate funds to develop the following system.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| ATACS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FORTAS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| VIP | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| RECCE Shell | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Tethered Balloon | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ASEMA | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FUAV | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Guardrail common sensor | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Ground based common sensor | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LBSR | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

22. If the Target Acquisition Assets used in the scenario in which you just participated were inadequate, please briefly describe what is needed to fill the void.

SURVEY II

NAME: Last, First, M.I. (please print)

_____

The following survey will give Army decision makers insight on your view of how technology may provide improved warfighting capability to a future force in the year 2015. The questions are general in nature, relating to characteristics and systems applicable to **Fire Support Weapon Systems and Munitions.** For your responses, consider your **general impression** gained through a look at the scenarios you examined. As always, **your first impression is usually best.** Your answers to these questions will be analyzed to help determine the direction of United States Army technology investments.

INSTRUCTIONS: **PLACE AN "X" IN THE COLUMN THAT *MOST CLOSELY* CORRESPONDS TO YOUR OPINION.**

**THE TERM "FIXED BUDGET" IN THE QUESTIONS BELOW IS A CONSTRAINT THAT ALLOWS YOU TO FUND SOME OF THE CHARACTERISTICS OR SYSTEMS YOU DESIRE, BUT NOT ALL.**

**THE ROW LABELED "VERBAL EXPRESSION OF PROBABILITY" IS A VERBAL DESCRIPTION OF THE PROBABILITY. THE ROW LABELED "NUMERICAL RANGE OF PROBABILITY" IS A NUMERICAL DESCRIPTION OF THE RANGE OF THE PROBABILITY. BOTH ARE PROVIDED TO ASSIST YOU IN YOUR ASSESSMENT.**

EXAMPLE: The following is an example question with responses marked in the correct manner.

Given a fixed budget and assuming that maximizing accuracy will win the war, indicate with what probability you would allocate funds to the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| Musket | (X) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| M16 Rifle | ( ) | ( ) | ( ) | ( ) | (X) | ( ) | ( ) |
| M14 Rifle | ( ) | ( ) | ( ) | ( ) | ( ) | (X) | ( ) |
| 9MM Pistol | ( ) | (X) | ( ) | ( ) | ( ) | ( ) | ( ) |

**PLEASE ANSWER THE QUESTIONS STARTING ON THE NEXT PAGE**

## Part I

**The following questions focus on Fire Support Weapon Systems that are currently being developed.**

Notes.

-The characteristic of Survivability in question 1 refers to emplace and displace time, fire mission execution time, and crew protection.

-The following abbreviations are used throughout the survey.

AFAS = Advanced Field Artillery System
NLOS = Non-line Of Sight
MLRS = Multiple Launch Rocket System
HIMARS = High Mobility Artillery Rocket System
F2S2 = Future Fire Support System
EMG = Electro Magnetic Gun
LONGFOG = Long Fiber-optic Guided Missile

1. Given a fixed budget from which you are to develop some but not all the following capabilities for Fire Support Weapons Systems to be fielded in the year 2015, indicate with what probability you would allocate funds to develop the following capabilities.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| Rate of Fire | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Strategic Deployability | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Operational Deployability | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Tactical Mobility | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Sustainability | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Survivability | | | | | | | |
| Environmental | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Material Handling | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Battle Damage | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Accuracy | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Range 0-60 KM | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| 60-100 KM | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| 100-160 KM | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| 160-490 KM | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Reliability | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Availability | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Maintainability | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

2. Given a fixed budget from which you are to develop some but not all the following systems, and assuming that maximizing rates of fire will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| AFAS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MLOS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MLRS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| HIMARS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LT WEIGHT 155 | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| F2S2 | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LONGFOG | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| EMG | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

3. Given a fixed budget and assuming that optimizing strategic deployability will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| AFAS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MLOS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MLRS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| HIMARS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LT WEIGHT 155 | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| F2S2 | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LONGFOG | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| EMG | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

4. Given a fixed budget and assuming that optimizing operational deployability will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| AFAS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MLOS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MLRS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| HIMARS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LT WEIGHT 155 | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| F2S2 | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LONGFOG | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| EMG | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

5. Given a fixed budget and assuming that optimizing sustainability will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| AFAS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MLOS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MLRS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| HIMARS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LT WEIGHT 155 | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| F2S2 | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LONGFOG | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| EMG | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

6. Given a fixed budget and assuming that optimizing environmental survivability will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| AFAS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MLOS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MLRS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| HIMARS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LT WEIGHT 155 | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| F2S2 | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LONGFOG | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| EMG | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

7. Given a fixed budget and assuming that optimizing material handling survivability will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| AFAS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MLOS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MLRS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| HIMARS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LT WEIGHT 155 | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| F2S2 | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LONGFOG | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| EMG | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

8. Given a fixed budget and assuming that optimizing battle damage survivability will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| AFAS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MLOS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MLRS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| HIMARS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LT WEIGHT 155 | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| F2S2 | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LONGFOG | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| EMG | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

9. Given a fixed budget and assuming that optimizing tactical mobility will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| AFAS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MLOS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MLRS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| HIMARS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LT WEIGHT 155 | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| F2S2 | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LONGFOG | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| EMG | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

10. Given a fixed budget and assuming that maximizing accuracy will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| AFAS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MLOS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MLRS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| HIMARS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LT WEIGHT 155 | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| F2S2 | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LONGFOG | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| EMG | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

11. Given a fixed budget and assuming that optimizing each system's capabilities in the 0 to 60 KM range will win the war, indicate with what probability you would allocate funds to develop the following systems. (The range of each system is given in kilometers in the parenthesis after each system's name)

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| AFAS (60) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MLOS (40) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MLRS (490) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| HIMARS (490) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LT WEIGHT 155 (40) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| F2S2 (490) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LONGFOG (100+) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| EMG (60) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

12. Given a fixed budget and assuming that optimizing each system's capabilities in the 60 to 100 KM range will win the war, indicate with what probability you would allocate funds to develop the following systems. (The range of each system is given in kilometers in the parenthesis after each system's name)

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| AFAS (60) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MLOS (40) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MLRS (490) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| HIMARS (490) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LT WEIGHT 155 (40) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| F2S2 (490) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LONGFOG (100+) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| EMG (60) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

13. Given a fixed budget and assuming that optimizing each system's capabilities in the 100 to 160 KM range will win the war, indicate with what probability you would allocate funds to develop the following systems. (The range of each system is given in kilometers in the parenthesis after each system's name)

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| AFAS (60) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MLOS (40) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MLRS (490) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| HIMARS (490) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LT WEIGHT 155 (40) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| F2S2 (490) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LONGFOG (100+) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| EMG (60) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

14. Given a fixed budget and assuming that optimizing each system's capabilities in the 160 to 490 KM range will win the war, indicate with what probability you would allocate funds to develop the following systems. (The range of each system is given in kilometers in the parenthesis after each system's name)

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| AFAS (60) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MLOS (40) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MLRS (490) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| HIMARS (490) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LT WEIGHT 155 (40) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| F2S2 (490) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LONGFOG (100+) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| EMG (60) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

15. Given a fixed budget and assuming that maximizing reliability will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| AFAS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MLOS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MLRS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| HIMARS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LT WEIGHT 155 | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| F2S2 | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LONGFOG | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| EMG | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

16. Given a fixed budget and assuming that maximizing availability will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| AFAS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MLOS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MLRS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| HIMARS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LT WEIGHT 155 | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| F2S2 | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LONGFOG | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| EMG | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

17. Given a fixed budget and assuming that maximizing maintainability will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| AFAS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MLOS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MLRS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| HIMARS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LT WEIGHT 155 | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| F2S2 | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LONGFOG | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| EMG | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

18. Given a fixed budget and the knowledge you gained from the last vignette, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| AFAS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MLOS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MLRS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MIMARS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LT WEIGHT 155 | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| F2S2 | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LONGFOG | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| EMG | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

19. If the weapon systems used in the scenario you just played were inadequate, can you briefly describe what is needed to fill the void.

## Part II

**The following questions focus on the Fire Support Munitions that are currently being developed.**

Notes

-The characteristic of Flexibility in question 1 refers to the munition's ability to attack across a spectrum of target types.

-Soft targets refer to self-propelled Artillery and wheeled vehicles.

-Hard targets refer to Tanks and Infantry Fighting Vehicles.

-The following abbreviations are used throughout the survey.

SADARM P3I = Search and Destroy Armor, Pre-planned Product Improvement
HICAP = High Capacity Munition
RFAM = Radio Frequency Attack Missile
GLTR = Ground Launched Tacit Rainbow
NLOS = Non-line Of Sight

1. Given a fixed budget from which you are to develop the following capabilities for Fire Support Munitions to be fielded in the year 2015, indicate with what probability you would allocate funds to develop the following capabilities.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| Ease of Handling | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Accuracy | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Range: 0 to 60 KM | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| 60 to 160 KM | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| 100 to 160 KM | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| 160 to 490 KM | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Loiter Ability | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Minimizing Collateral Damage | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Flexibility | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Lethality on soft Targets | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Lethality on hard Targets | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Lethality on emitters | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

2. Given a fixed budget and assuming that optimizing ease of handling will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| SADARM P3I | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MISSION KILL MUNITION | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| DEEP ATTACK SMART | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ENHANCED BLAST | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| HICAP | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| RFAM | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| SMART/BRILLIANT MINE | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FUTURE SMART MUNITION | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LONGARM | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| GLTR | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LONGFOG | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MLOS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

3. Given a fixed budget and assuming that maximizing accuracy will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| SADARM P3I | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MISSION KILL MUNITION | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| DEEP ATTACK SMART | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ENHANCED BLAST | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| HICAP | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| RFAM | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| SMART/BRILLIANT MINE | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FUTURE SMART MUNITION | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LONGARM | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| GLTR | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LONGFOG | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MLOS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

4. Given a fixed budget and assuming that optimizing each munition's capabilities in the 0 to 60 KM range will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| SADARM P3I | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MISSION KILL MUNITION | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| DEEP ATTACK SMART | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ENHANCED BLAST | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| HICAP | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| RFAM | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| SMART/BRILLIANT MINE | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FUTURE SMART MUNITION | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LONGARM | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| GLTR | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LONGFOG | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MLOS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

5. Given a fixed budget and assuming that optimizing each munitions capabilities in the 60 to 100 KM range will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| SADARM P3I | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MISSION KILL MUNITION | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| DEEP ATTACK SMART | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ENHANCED BLAST | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| HICAP | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| RFAM | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| SMART/BRILLIANT MINE | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FUTURE SMART MUNITION | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LONGARM | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| GLTR | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LONGFOG | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MLOS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

6. Given a fixed budget and assuming that optimizing each munitions capabilities in the 100 to 160 KM range will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| SADARM P3I | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MISSION KILL MUNITION | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| DEEP ATTACK SMART | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ENHANCED BLAST | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| HICAP | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| RFAM | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| SMART/BRILLIANT MINE | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FUTURE SMART MUNITION | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LONGARM | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| GLTR | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LONGFOG | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MLOS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

7. Given a fixed budget and assuming that optimizing each munitions capabilities in the 160 to 490 KM range will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| SADARM P3I | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MISSION KILL MUNITION | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| DEEP ATTACK SMART | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ENHANCED BLAST | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| HICAP | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| RFAM | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| SMART/BRILLIANT MINE | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FUTURE SMART MUNITION | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LONGARM | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| GLTR | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LONGFOG | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MLOS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

8. Given a fixed budget and assuming that optimizing loiter capability will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| SADARM P3I | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MISSION KILL MUNITION | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| DEEP ATTACK SMART | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ENHANCED BLAST | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| HICAP | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| RFAM | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| SMART/BRILLIANT MINE | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FUTURE SMART MUNITION | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LONGARM | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| GLTR | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LONGFOG | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MLOS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

9. Given a fixed budget and assuming that optimizing flexibility to attack different targets will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| SADARM P3I | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MISSION KILL MUNITION | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| DEEP ATTACK SMART | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ENHANCED BLAST | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| HICAP | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| RFAM | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| SMART/BRILLIANT MINE | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FUTURE SMART MUNITION | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LONGARM | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| GLTR | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LONGFOG | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MLOS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

10. Given a fixed budget and assuming that maximizing each munition's lethality against hard targets (Tanks and Infantry Fighting Vehicles) will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| SADARM P3I | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MISSION KILL MUNITION | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| DEEP ATTACK SMART | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ENHANCED BLAST | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| BICAP | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| RFAM | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| SMART/BRILLIANT MINE | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FUTURE SMART MUNITION | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LONGARM | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| GLTR | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LONGFOG | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MLOS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

11. Given a fixed budget and assuming that maximizing each munition's lethality against soft targets (self-propelled Artillery and wheeled vehicles) will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| SADARM P3I | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MISSION KILL MUNITION | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| DEEP ATTACK SMART | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ENHANCED BLAST | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| BICAP | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| RFAM | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| SMART/BRILLIANT MINE | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FUTURE SMART MUNITION | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LONGARM | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| GLTR | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LONGFOG | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MLOS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

12. Given a fixed budget and assuming that maximizing each munition 's lethality against emitters will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| SADARM P3I | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MISSION KILL MUNITION | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| DEEP ATTACK SMART | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ENHANCED BLAST | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| BICAP | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| RFAM | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| SMART/BRILLIANT MINE | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FUTURE SMART MUNITION | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LONGARM | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| GLTR | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LONGFOG | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MLOS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

13. Given a fixed budget and assuming that minimizing collateral damage will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| SADARM P3I | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MISSION KILL MUNITION | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| DEEP ATTACK SMART | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ENHANCED BLAST | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| BICAP | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| RFAM | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| SMART/BRILLIANT MINE | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FUTURE SMART MUNITION | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LONGARM | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| GLTR | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LONGFOG | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MLOS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

14. Given a fixed budget and the knowledge you gained from the last vignette, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| SADARM P3I | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MISSION KILL MUNITION | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| DEEP ATTACK SMART | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ENHANCED BLAST | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| BICAP | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| RFAM | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| SMART/BRILLIANT MINE | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FUTURE SMART MUNITION | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LONGARM | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| GLTR | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LONGFOG | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| MLOS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

15. If the munitions used in the scenario you just played were inadequate, can you briefly describe what is needed to fill the void.

SURVEY III

NAME: Last, First, M.I. (please print)

_____

The following survey will give Army decision makers insight on your view of how technology may provide improved warfighting capability to a future force in the year 2015. The questions are general in nature, relating to characteristics and systems applicable to **Fire Support Command and Control Systems**. For your responses, consider your **general impression** gained through a look at the scenarios you examined. As always, **your first impression is usually best.** Your answers to these questions will be analyzed to help determine the direction of United States Army technology investments.

INSTRUCTIONS: PLACE AN "X" IN THE COLUMN THAT *MOST CLOSELY* CORRESPONDS TO YOUR OPINION.

THE TERM "FIXED BUDGET" IN THE QUESTIONS BELOW IS A CONSTRAINT THAT ALLOWS YOU TO FUND SOME OF THE CHARACTERISTICS OR SYSTEMS YOU DESIRE, BUT NOT ALL.

THE ROW LABELED "VERBAL EXPRESSION OF PROBABILITY" IS A VERBAL DESCRIPTION OF THE PROBABILITY. THE ROW LABELED "NUMERICAL RANGE OF PROBABILITY" IS A NUMERICAL DESCRIPTION OF THE RANGE OF THE PROBABILITY. BOTH ARE PROVIDED TO ASSIST YOU IN YOUR ASSESSMENT.

EXAMPLE: The following is an example question with responses marked in the correct manner.

Given a fixed budget and assuming that maximizing accuracy will win the war, indicate with what probability you would allocate funds to the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| Musket | (X) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| M16 Rifle | ( ) | ( ) | ( ) | ( ) | (X) | ( ) | ( ) |
| M14 Rifle | ( ) | ( ) | ( ) | ( ) | ( ) | (X) | ( ) |
| 9MM Pistol | ( ) | (X) | ( ) | ( ) | ( ) | ( ) | ( ) |

PLEASE ANSWER THE QUESTIONS STARTING ON THE NEXT PAGE

**The following questions focus on Command and Control Systems that are being considered for the Fire Support.**

The following abbreviations are used throughout the survey.
AFATDS = Advanced Field Artillery Tactical Data System
FFSCCS = Future Fire Support Command and Control System

1. Given a fixed budget from which you are to develop some but not all the following capabilities for Fire Support Command and Control Systems to be fielded in the year 2015, indicate with what probability you would allocate funds to develop the following capabilites.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| Long Communications Range | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Large Communications Capacity | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Ease of Operation | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Survivability Against | | | | | | | |
| Field Artillery | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Small Arms | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Large Caliber Direct Fire | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Directed Energy | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Reliability | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Availability | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Maintainability | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Strategic Deployability | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Operational Deployability | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Tactical Mobility | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Short Emplace/Displace Time | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Redundancy | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Susceptible to Countermeasures | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FA Mission Area Commonality | | | | | | | |
| within the Light Force | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| within the Heavy Force | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Cross Mission Area Commonality | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

2. Given a fixed budget from which you are to develop some but not all the following systems and assuming that maximizing communications range will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| AFATDS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FFSCCS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Low Echelon Knowledge System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Wide Area Communications | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Force Level Knowledge System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Distributed IEW Fusion System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

3. Given a fixed budget and assuming that maximizing communications capacity will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| AFATDS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FFSCCS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Low Echelon Knowledge System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Wide Area Communications | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Force Level Knowledge System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Distributed IEW Fusion System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

4. Given a fixed budget and assuming that maximizing ease of operation will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| AFATDS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FFSCCS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Low Echelon Knowledge System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Wide Area Communications | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Force Level Knowledge System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Distributed IEW Fusion System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

5. Given a fixed budget and assuming that maximizing survivability against artillery fire will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| AFATDS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FFSCCS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Low Echelon Knowledge System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Wide Area Communications | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Force Level Knowledge System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Distributed IEW Fusion System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

6. Given a fixed budget and assuming that maximizing survivability against small arms fire will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| AFATDS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FFSCCS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Low Echelon Knowledge System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Wide Area Communications | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Force Level Knowledge System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Distributed IEW Fusion System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

7. Given a fixed budget and assuming that maximizing survivability against large caliber weapons fire will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| AFATDS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FFSCCS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Low Echelon Knowledge System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Wide Area Communications | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Force Level Knowledge System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Distributed IEW Fusion System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

8. Given a fixed budget and assuming that maximizing survivability against directed energy weapons will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| AFATDS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FFSCCS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Low Echelon Knowledge System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Wide Area Communications | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Force Level Knowledge System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Distributed IEW Fusion System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

9. Given a fixed budget and assuming that maximizing reliability will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| AFATDS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FFSCCS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Low Echelon Knowledge System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Wide Area Communications | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Force Level Knowledge System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Distributed IEW Fusion System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

10. Given a fixed budget and assuming that optimizing maintainability will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| AFATDS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FFSCCS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Low Echelon Knowledge System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Wide Area Communications | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Force Level Knowledge System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Distributed IEW Fusion System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

11. Given a fixed budget and assuming that optimizing strategic deployability will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| AFATDS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FFSCCS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Low Echelon Knowledge System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Wide Area Communications | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Force Level Knowledge System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Distributed IEW Fusion System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

12. Given a fixed budget and assuming that optimizing operational deployability will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| AFATDS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FFSCCS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Low Echelon Knowledge System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Wide Area Communications | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Force Level Knowledge System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Distributed IEW Fusion System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

13. Given a fixed budget and assuming that optimizing tactical mobility will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| AFATDS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FFSCCS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Low Echelon Knowledge System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Wide Area Communications | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Force Level Knowledge System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Distributed IEW Fusion System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

14. Given a fixed budget and assuming that minimizing emplace/displace time will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| AFATDS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FFSCCS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Low Echelon Knowledge System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Wide Area Communications | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Force Level Knowledge System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Distributed IEW Fusion System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

15. Given a fixed budget and assuming that maximizing redundancy will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| AFATDS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FFSCCS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Low Echelon Knowledge System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Wide Area Communications | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Force Level Knowledge System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Distributed IEW Fusion System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

16. Given a fixed budget and assuming that minimizing susceptibility to countermeasures will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| AFATDS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FFSCCS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Low Echelon Knowledge System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Wide Area Communications | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Force Level Knowledge System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Distributed IEW Fusion System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

17. Given a fixed budget and assuming that maximizing Fire Support Mission Area Commonality within the Light Force will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| AFATDS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FFSCCS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Low Echelon Knowledge System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Wide Area Communications | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Force Level Knowledge System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Distributed IEW Fusion System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

18. Given a fixed budget and assuming that maximizing Fire Support Mission Area Commonality within the Heavy Force will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| AFATDS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FFSCCS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Low Echelon Knowledge System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Wide Area Communications | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Force Level Knowledge System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Distributed IEW Fusion System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

19. Given a fixed budget and assuming that maximizing availability will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| AFATDS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FFSCCS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Low Echelon Knowledge System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Wide Area Communications | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Force Level Knowledge System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Distributed IEW Fusion System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

20. Given a fixed budget and assuming that maximizing cross mission area commonality will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| AFATDS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FFSCCS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Low Echelon Knowledge System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Wide Area Communications | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Force Level Knowledge System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Distributed IEW Fusion System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

21. Given a fixed budget and the knowledge you gained from the last vignette, indicate with what probability you would allocate funds to the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| AFATDS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| FPSCCS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Low Echelon Knowledge System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Wide Area Communications | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Force Level Knowledge System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Distributed IEW Fusion System | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

22. If the Command and Control assets used in the scenario you just played were inadequate, please briefly describe what is needed to fill the void.

SURVEY IV

NAME: Last, First, M.I. (please print)

_____

The following survey will give Army decision makers insight on your view of how technology may provide improved warfighting capability to a future force in the year 2015. The questions are general in nature, relating to characteristics and systems applicable to **Field Artillery Support and Sustainment and Strategic Deployment and Tactical Mobility Systems.** For your responses, consider your **general impression** gained through a look at the scenarios you examined. As always, **your first impression is usually best.** Your answers to these questions will be analyzed to help determine the direction of United States Army technology investments.

INSTRUCTIONS: PLACE AN "X" IN THE COLUMN THAT *MOST CLOSELY* CORRESPONDS TO YOUR OPINION.

THE TERM "FIXED BUDGET" IN THE QUESTIONS BELOW IS A CONSTRAINT THAT ALLOWS YOU TO FUND SOME OF THE CHARACTERISTICS OR SYSTEMS YOU DESIRE, BUT NOT ALL.

THE ROW LABELED "VERBAL EXPRESSION OF PROBABILITY" IS A VERBAL DESCRIPTION OF THE PROBABILITY. THE ROW LABELED "NUMERICAL RANGE OF PROBABILITY" IS A NUMERICAL DESCRIPTION OF THE RANGE OF THE PROBABILITY. BOTH ARE PROVIDED TO ASSIST YOU IN YOUR ASSESSMENT.

EXAMPLE: The following is an example question with responses marked in the correct manner.

Given a fixed budget and assuming that maximizing accuracy will win the war, indicate with what probability you would allocate funds to the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| Musket | (X) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| M16 Rifle | ( ) | ( ) | ( ) | ( ) | (X) | ( ) | ( ) |
| M14 Rifle | ( ) | ( ) | ( ) | ( ) | ( ) | (X) | ( ) |
| 9MM Pistol | ( ) | (X) | ( ) | ( ) | ( ) | ( ) | ( ) |

PLEASE ANSWER THE QUESTIONS STARTING ON THE NEXT PAGE

**The following questions focus on Field Artillery Support and Sustainment Systems and Strategic Deployment and Tactical Mobility Considerations.**

The following abbreviations are used throughout the survey.

FARV-A = Future Armored Resupply Vehicle
REARMS = Rapidly Deployed Artillery Resupply Module
F2S2 = Future Fire Support System
TRAC = Trajectory Realtime Analysis Closed Loop
ACA = Advanced Cargo Aircraft
LAMS = Logistics Air Mobility System
MHE = Material Handling Equipment

1. Given a fixed budget from which you are to develop some but not all the following capabilities for Field Artillery Support and Sustainment Systems to be fielded in the year 2015 and the requirement for Strategic Deployability and Tactical Mobility, indicate with what probability you would allocate funds to develop the following capabilities.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| Minimize Shipping Weight | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Maximize Containerization | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Strategic Deployability | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Operational Deployability | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Tactical Mobility | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Survivability | | | | | | | |
| Environment | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Material Handling | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Battle Damage | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Reliability | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Battlefield Operating Range | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Mission Area Commonality | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Minimize Number of Parts | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Maximize Common Parts | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Minimize Unique Tools | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Minimize Tools | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Maximize MHE | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Maximize Automated MHE | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

2. Given a fixed budget from which you are to develop some but not all the following systems and assuming that minimizing shipping weight will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| FARV-A | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| REARMS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| F2S2 (Support Module) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| TRAC | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ACA | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LAMS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Robotic Log. Resupply Vehicle | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

3. Given a fixed budget and assuming that maximizing containerization will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| FARV-A | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| REARMS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| F2S2 (Support Module) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| TRAC | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ACA | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LAMS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Robotic Log. Resupply Vehicle | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

4. Given a fixed budget and assuming that optimizing strategic deployability will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| FARV-A | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| REARMS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| F2S2 (Support Module) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| TRAC | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ACA | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LAMS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Robotic Log. Resupply Vehicle | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

5. Given a fixed budget and assuming that optimizing the operational deployment capability will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| FARV-A | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| REARMS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| F2S2 (Support Module) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| TRAC | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ACA | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LAMS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Robotic Log. Resupply Vehicle | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

6. Given a fixed budget and assuming that optimizing the tactical mobility capability will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| FARV-A | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| REARMS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| F2S2 (Support Module) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| TRAC | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ACA | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LAMS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Robotic Log. Resupply Vehicle | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

7. Given a fixed budget and assuming that maximizing environmental survivability will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| FARV-A | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| REARMS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| F2S2 (Support Module) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| TRAC | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ACA | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LAMS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Robotic Log. Resupply Vehicle | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

8. Given a fixed budget and assuming that maximizing material handling survivability will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| FARV-A | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| REARMS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| F2S2 (Support Module) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| TRAC | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ACA | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LAMS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Robotic Log. Resupply Vehicle | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

9. Given a fixed budget and assuming that maximizing battle damage survivability will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| FARV-A | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| REARMS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| F2S2 (Support Module) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| TRAC | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ACA | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LAMS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Robotic Log. Resupply Vehicle | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

10. Given a fixed budget and assuming that maximizing reliability will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| FARV-A | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| REARMS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| F2S2 (Support Module) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| TRAC | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ACA | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LAMS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Robotic Log. Resupply Vehicle | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

11. Given a fixed budget and assuming that maximizing battlefield operating range will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| FARV-A | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| REARMS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| F2S2 (Support Module) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| TRAC | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ACA | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LAMS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Robotic Log. Resupply Vehicle | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

12. Given a fixed budget and assuming that maximizing mission area commonality will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| FARV-A | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| REARMS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| F2S2 (Support Module) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| TRAC | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ACA | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LAMS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Robotic Log. Resupply Vehicle | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

13. Given a fixed budget and assuming that minimizing the number of parts will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| FARV-A | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| REARMS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| F2S2 (Support Module) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| TRAC | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ACA | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LAMS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Robotic Log. Resupply Vehicle | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

14. Given a fixed budget and assuming that maximizing common parts will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| FARV-A | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| REARMS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| F2S2 (Support Module) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| TRAC | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ACA | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LAMS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Robotic Log. Resupply Vehicle | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

15. Given a fixed budget and assuming that minimizing the number of unique tools will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| FARV-A | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| REARMS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| F2S2 (Support Module) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| TRAC | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ACA | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LAMS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Robotic Log. Resupply Vehicle | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

16. Given a fixed budget and assuming that minimizing the number of total tools will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| FARV-A | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| REARMS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| F2S2 (Support Module) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| TRAC | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ACA | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LAMS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Robotic Log. Resupply Vehicle | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

17. Given a fixed budget and assuming that maximizing the amount of material handling equipment will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| FARV-A | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| REARMS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| F2S2 (Support Module) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| TRAC | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ACA | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LAMS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Robotic Log. Resupply Vehicle | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

18. Given a fixed budget and assuming that maximizing the amount of automated material handling equipment will win the war, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| FARV-A | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| REARMS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| F2S2 (Support Module) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| TRAC | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ACA | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LAMS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Robotic Log. Resupply Vehicle | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

19. Given a fixed budget and the knowledge you gained from the last vignette, indicate with what probability you would allocate funds to develop the following systems.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| FARV-A | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| REARMS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| F2S2 (Support Module) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| TRAC | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| ACA | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| LAMS | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Robotic Log. Resupply Vehicle | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

20. What additional requirements need to be addressed in order to support EMG weapons?

_____
_____
_____
_____
_____

21. If the Support and Sustainment Systems and Strategic Deployment and Tactical Mobility capabilities used in the scenario you just played were inadequate, please briefly describe what is needed to fill the void.

_____
_____
_____
_____
_____

SURVEY V

NAME: Last, First, M.I. (please print)

_____

The following survey will give Army decision makers insight on your view of how technology may provide improved warfighting capability to a future force in the year 2015. The questions are general in nature, relating to characteristics and systems applicable to **Combat Power and the Battlefield Operating Systems.** For your responses, consider your **general impression** gained through a look at the scenarios you examined. As always, **your first impression is usually best.** Your answers to these questions will be analyzed to help determine the direction of United States Army technology investments.

INSTRUCTIONS: PLACE AN "X" IN THE COLUMN THAT *MOST CLOSELY* CORRESPONDS TO YOUR OPINION.

THE TERM "FIXED BUDGET" IN THE QUESTIONS BELOW IS A CONSTRAINT THAT ALLOWS YOU TO FUND SOME OF THE CHARACTERISTICS OR SYSTEMS YOU DESIRE, BUT NOT ALL.

THE ROW LABELED "VERBAL EXPRESSION OF PROBABILITY" IS A VERBAL DESCRIPTION OF THE PROBABILITY. THE ROW LABELED "NUMERICAL RANGE OF PROBABILITY" IS A NUMERICAL DESCRIPTION OF THE RANGE OF THE PROBABILITY. BOTH ARE PROVIDED TO ASSIST YOU IN YOUR ASSESSMENT.

EXAMPLE: The following is an example question with responses marked in the correct manner.

Given a fixed budget and assuming that maximizing accuracy will win the war. indicate with what probability you would allocate funds to the following systems.

| Verbal Expression of Probability | very small | small | not great | borderline | reasonable | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| Musket | (X) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| M16 Rifle | ( ) | ( ) | ( ) | ( ) | (X) | ( ) | ( ) |
| M14 Rifle | ( ) | ( ) | ( ) | ( ) | ( ) | (X) | ( ) |
| 9MM Pistol | ( ) | (X) | ( ) | ( ) | ( ) | ( ) | ( ) |

PLEASE ANSWER THE QUESTIONS STARTING ON THE NEXT PAGE

This section of the survey considers the physical components of COMBAT POWER, Firepower, Maneuver, and Protection.

1. Many sectors of society develop future technologies that are used by the Army, foreign countries, defense industries, and other services. Many of these do not need major funding from the Army. Understanding this fact, the Army is given a fixed budget from which to develop systems that improve the following components (improvement is not necessarily equal). Assume that maximizing combat power through improved technology in the year 2015 is the best strategy, regardless of the source of development. Indicate with what probability the Army should allocate funds to the following components.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| Firepower | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Maneuver | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Protection | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

This question focuses on FIREPOWER.

2. Many sectors of society develop future technologies that are used by the Army, foreign countries, defense industries, and other services. Many of these do not need major funding from the Army. Understanding this fact, the Army is given a fixed budget from which to develop systems that improve the following components (improvement is not necessarily equal). Assume that maximizing firepower through improved technology in the year 2015 is the best strategy, regardless of the source of development. Indicate with what probability the Army should allocate funds to the following capabilities.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| Active Target Detection | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Passive Target Detection | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Target Identification | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Non-cooperative IFF | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Target Acquisition | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Target Engagement | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Accuracy | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Lethality | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

**This question focuses on MANEUVER.**

3. Many sectors of society develop future technologies that are used by the Army, foreign countries, defense industries, and other services. Many of these do not need major funding from the Army. Understanding this fact, the Army is given a fixed budget from which to develop systems that improve the following components (improvement is **not** necessarily equal). Assume that maximizing through improved technology in the year 2015 is the best strategy, regardless of the source of development. Indicate with what probability the Army should allocate funds to the following components.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| Greater Acceleration | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Greater Agility | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Less Weight | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Obstacle crossing | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Tactical speed | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Operational speed | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Strategic speed | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Operating Range | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Maintainability | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

**This question focuses on PROTECTION.**

4. Many sectors of society develop future technologies that are used by the Army, foreign countries, defense industries, and other services. Many of these do not need major funding from the Army. Understanding this fact, the Army is given a fixed budget from which to develop systems that improve the following components (improvement is **not** necessarily equal). Assume that maximizing protection through improved technology in the year 2015 is the best strategy, regardless of the source of development. Indicate with what probability the Army should allocate funds to the following components.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| Size | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Armor quality | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Signature | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Defilade Firing | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Over the Horizon Firing | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| EM/Visual camouflage | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Early warning sensors | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Decoys | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Low Observables | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Emplace/displace time | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| NBC Detection | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| NBC Protection | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

The following question focuses on FORCE PROJECTION.

5. Many sectors of society develop future technologies that are used by the Army, foreign countries, defense industries, and other services. Many of these do not need major funding from the Army. Understanding this fact, the Army is given a fixed budget from which to develop systems that improve the following components (improvement is not necessarily equal). Assume that maximizing Force Projection through improved technology in the year 2015 is the best strategy, regardless of the source of development. Indicate with what probability the Army should allocate funds to the following components.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| Strategic Deployment | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Operational Deployment | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Tactical Mobility | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

The following question focuses on UNIT SUPPORT.

6. Many sectors of society develop future technologies that are used by the Army, foreign countries, defense industries, and other services. Many of these do not need major funding from the Army. Understanding this fact, the Army is given a fixed budget from which to develop systems that improve the following components (improvement is not necessarily equal). Assume that maximizing Unit Support through improved technology in the year 2015 is the best strategy, regardless of the source of development. Indicate with what probability the Army should allocate funds to the following components.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| Maintainability | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Supply Distribution | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Reliability | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Tactical Supply Transport | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Tactical POL Transport | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

**The following question focuses on SUSTAINMENT.**

7. Many sectors of society develop future technologies that are used by the Army, foreign countries, defense industries, and other services. Many of these do not need major funding from the Army. Understanding this fact, the Army is given a fixed budget from which to develop systems that improve the following components (improvement is not necessarily equal). Assume that maximizing sustainment through improved technology in the year 2015 is the best strategy, regardless of the source of development. Indicate with what probability the Army should allocate funds to the following components.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| Medical Evacuation | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Unit Reconstitution | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Medical Capacity | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Logistical Mobility | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Industrial Base | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Soldier Training Base | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Manpower Management | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

**The following question focuses on the BATTLEFIELD OPERATING SYSTEM of FIRE SUPPORT.**

Notes: -The abbreviation LOS stands for Line of Sight.
-The abbreviation NLOS stands for Non-line of Sight.

8. You are given a fixed budget from which you are to develop capabilities that improve the following systems (improvement is not necessarily equal). Assume that maximizing the amount of improvement by the year 2015 is the best strategy. Indicate with what probability you will allocate funds to the following systems?

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| Mortars | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Field Artillery Cannon Fire | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Ground Launched Missile(LOS) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Ground Launched Missile(NLOS) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Naval Cannon Fire | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Naval Missiles (LOS) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Naval Missiles (NLOS) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Air Launched Cannon Fire | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Air Launched Missile (LOS) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Air Launched Missile (NLOS) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

**The following question focuses on operational capabilities of the FIELD ARTILLERY BATTLEFIELD FUNCTIONAL MISSION AREA.**

9. You are given a fixed budget from which you are to develop systems that improve the following capabilities (improvement is not necessarily equal). Assume that maximizing the improvement by the year 2015 is the best strategy. Indicate with what probability you will allocate funds to the following capabilities?

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| Counterfire | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Attack of Uncommitted Force | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Suppression of Air Defense | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Attack of Emitters | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Chemical/Nuclear Deterrence | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Attack of Close in Forces | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Missile Defense | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Countermobility | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

SURVEY VI

NAME: Last, First, M.I. (please print)

_____

The following survey will give Army decision makers insight on your view of how technology may provide improved warfighting capability to a future force in the year 2015. The questions are general in nature, relating to characteristics and systems applicable to **emerging technologies and systems.** For your responses, consider your **general impression** gained through a look at the scenarios you examined. As always, **your first impression is usually best.** Your answers to these questions will be analyzed to help determine the direction of United States Army technology investments.

INSTRUCTIONS: PLACE AN "X" IN THE COLUMN THAT *MOST CLOSELY* CORRESPONDS TO YOUR OPINION.

THE TERM "FIXED BUDGET" IN THE QUESTIONS BELOW IS A CONSTRAINT THAT ALLOWS YOU TO FUND SOME OF THE CHARACTERISTICS OR SYSTEMS YOU DESIRE, BUT NOT ALL.

THE ROW LABELED "VERBAL EXPRESSION OF PROBABILITY" IS A VERBAL DESCRIPTION OF THE PROBABILITY. THE ROW LABELED "NUMERICAL RANGE OF PROBABILITY" IS A NUMERICAL DESCRIPTION OF THE RANGE OF THE PROBABILITY. BOTH ARE PROVIDED TO ASSIST YOU IN YOUR ASSESSMENT.

EXAMPLE: The following is an example question with responses marked in the correct manner.

Given a fixed budget and assuming that maximizing accuracy will win the war, indicate with what probability you would allocate funds to the following systems.

| Verbal Expression of Probability | very small | small | not great | borderline | reasonable | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| Musket | (X) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| M16 Rifle | ( ) | ( ) | ( ) | ( ) | (X) | ( ) | ( ) |
| M14 Rifle | ( ) | ( ) | ( ) | ( ) | ( ) | (X) | ( ) |
| 9MM Pistol | ( ) | (X) | ( ) | ( ) | ( ) | ( ) | ( ) |

PLEASE ANSWER THE QUESTIONS STARTING ON THE NEXT PAGE

**The following questions concern technologies that dominated the last Technology Based Seminar Wargame. These technologies are the Army's emerging technologies.**

1. Assume that all technologies can be successfully developed. You still have a fixed budget. Assume that maximizing the investment in those technologies that will have a major impact on Fire Support Systems by the year 2015 is the best strategy. Indicate with what probability you would allocate funds to develop some but not all the following technologies.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| Adv. Materials | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Adv. Propulsion | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Adv. Signal Processing/Computing | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Artificial Intelligence | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Biotechnology | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Directed Energy Weapons | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Low Observables | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Micro-Electronics/ Photonics/Acoustics | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Neuroscience | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Power Generation/ Storage/Conditioning | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Protection/Lethality | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Robotics | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Space Technology | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

2. You still have a fixed budget. Assume that maximizing investment in those technologies that can be developed to a level where they can be successfully incorporated into Fire Support Systems by the year 2015 is the best strategy. Indicate with what probability you would allocate funds to develop some but not all the following technologies.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| Adv. Materials | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Adv. Propulsion | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Adv. Signal Processing/Computing | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Artificial Intelligence | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Biotechnology | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Directed Energy Weapons | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Low Observables | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Micro-Electronics/ Photonics/Acoustics | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Neuroscience | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Power Generation/ Storage/Conditioning | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Protection/Lethality | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Robotics | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Space Technology | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

3. You still have a fixed budget. You understand that the Army's level of advancement in each of the technologies is quite different, and that civilian research is ongoing in many emerging technologies. Assume that maximizing the number of technologies that can be successfully used in Fire Support Systems by the year 2015 regardless of their source of development is the best strategy. Indicate with what probability you would allocate funds to develop the following technologies.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| Adv. Materials | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Adv. Propulsion | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Adv. Signal Processing/Computing | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Artificial Intelligence | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Biotechnology | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Directed Energy Weapons | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Low Observables | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Micro-Electronics/ Photonics/Acoustics | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Neuroscience | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Power Generation/ Storage/Conditioning | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Protection/Lethality | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Robotics | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Space Technology | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

**The following questions focus on the top ten systems/capabilities identified in the last Technology Based Seminar Wargame.**

4. Assume that all systems/capabilities can be successfully developed. You still have a fixed budget. Assume that maximizing the investment in those systems/capabilities that will have a major impact on Fire Support Systems by the year 2015 is the best strategy. Indicate with what probability you would allocate funds to develop the following systems/capabilities.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| Advanced Soldier Suit | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Precision Long Range Weapons | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Multi-Spectral Sensor/Fusion | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Deployment and Logistics Systems | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Nonlethal Weapons | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Electric Ground Mobility Systems | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Robotics | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Advanced Battle Management | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Decoys and Deception | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Air Mobility Systems | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

5. You still have a fixed budget. Assume that maximizing investment in those systems/capabilities that can be developed to a level where they can be successfully incorporated into Fire Support Systems by the year 2015 is the best strategy. Indicate with what probability you would allocate funds to develop the following systems/capabilities.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| Advanced Soldier Suit | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Precision Long Range Weapons | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Multi-Spectral Sensor/Fusion | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Deployment and Logistics Systems | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Nonlethal Weapons | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Electric Ground Mobility Systems | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Robotics | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Advanced Battle Management | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Decoys and Deception | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Air Mobility Systems | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

6. You still have a fixed budget. You acknowledge that the Army's level of advancement in each of the systems/capabilities is quite different, and that civilian research is ongoing in many of the systems/capabilities. Assume that maximizing the number of systems/capabilities that can be successfully used in Fire Support Systems by the year 2015 regardless of their source of development is the best strategy. Indicate with what probability you would allocate funds to develop the following system/capabilities.

| Verbal Expression of Probability | very small | small | not great | border-line | reason-able | high | very high |
|---|---|---|---|---|---|---|---|
| Numerical Range of Probability | 0-14 | 15-28 | 29-42 | 43-57 | 58-71 | 72-85 | 86-100 |
| Advanced Soldier Suit | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Precision Long Range Weapons | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Multi-Spectral Sensor/Fusion | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Deployment and Logistics Systems | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Nonlethal Weapons | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Electric Ground Mobility Systems | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Robotics | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Advanced Battle Management | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Decoys and Deception | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |
| Air Mobility Systems | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) | ( ) |

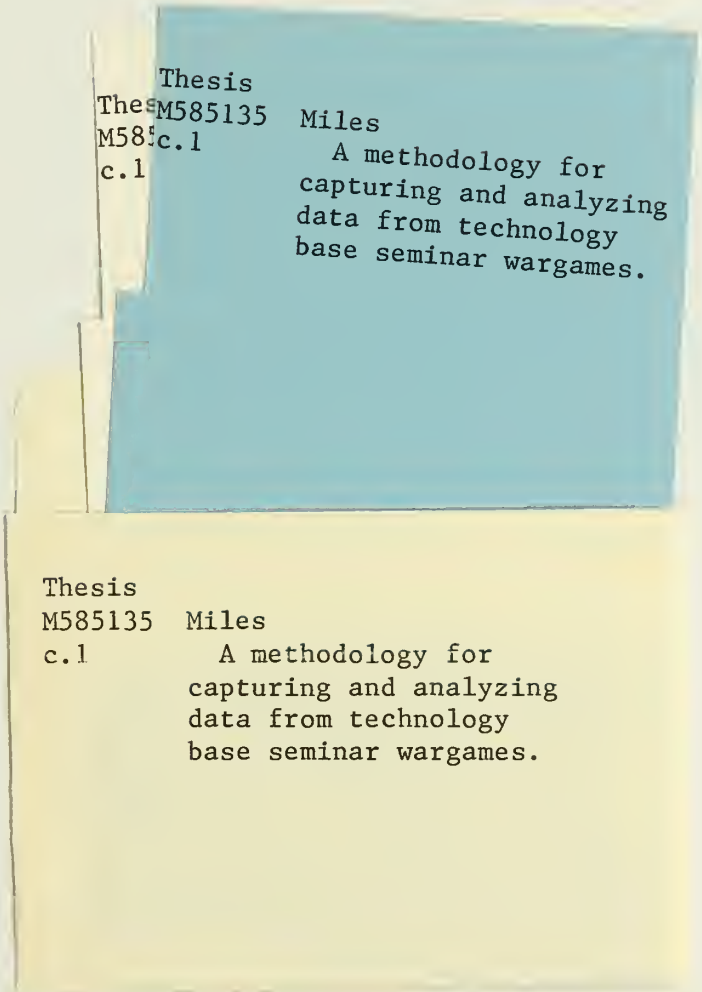
INITIAL DISTRIBUTION LIST

| | | No. Copies |
|---|---|---|
| 1. | Library, Code 0142<br>Naval Postgraduate School<br>Monterey, CA 93943-5002 | 2 |
| 2. | Dr. Samuel H. Parry, Code OR/PY<br>Department of Operations Research<br>Naval Postgraduate School<br>Monterey, CA 93943-5002 | 2 |
| 3. | RAND Corporation<br>ATTN: Kenneth A. Solomon<br>1700 Main ST.<br>Santa Monica, CA 90407-2138 | 1 |
| 4. | Division of Medicine<br>Walter Reed Army Institute of Research<br>ATTN: SGRD-UWH-E, Kenneth T. Dodd<br>Washington, D.C. 20307-5100 | 1 |
| 5. | Commander<br>U.S. Army Material Command<br>Technology Planning and Management<br>ATTN: Sally J. Van Nostrand<br>2800 Powder Mill Road<br>Adelphi, MD 20783-1145 | 1 |
| 6. | CPT Jeff Miles<br>40 Eldredge St.<br>Battle Creek, MI 49017 | 1 |
| 7. | Commander<br>U.S. Army Training and Doctrine Command<br>ATTN: ATCD<br>Fort Monroe, VA 23651-5000 | 1 |
| 8. | Director<br>U.S. Army TRADOC Analysis Command - Monterey<br>ATTN: ATRC-RD<br>P.O. Box 8692<br>Monterey, CA 93943-0692 | 1 |
| 9. | Commandant<br>USAFAS<br>ATTN: ATSF-CSI-T, Dale Bailey<br>FT. Sill, OK 73503-5600 | 1 |

10. Defense Technical Information Center 2
Cameron Station
Alexandria, VA 22304-6145

11. Center for Strategic and International Studies 1
ATTN: Mr. Jim Blackwell
1800 K Street N.W.
Suite 400
Washington, DC 2006

12. Headquarters, Department of the Army 1
DUSA-OR
ATTN: Mr. Walter W. Hollis
Room 2E660, The Pentagon
Washington, DC 20310-0102




Thesis
M585135 Miles
c.1
A methodology for
capturing and analyzing
data from technology
base seminar wargames.

DUDLEY KNOX LIBRARY
3 2768 00018377 6